Vol. XX. Part 8.

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5.9.22

The Journal of the Department of Agriculture of Victoria, Australia.

August, 1922.

PRINCIPAL CONTENTS

Inter-District Farm Competition

Some Wine Defects

Weeds and Their Eradication

Two New Varieties of Blight-Proof Apples

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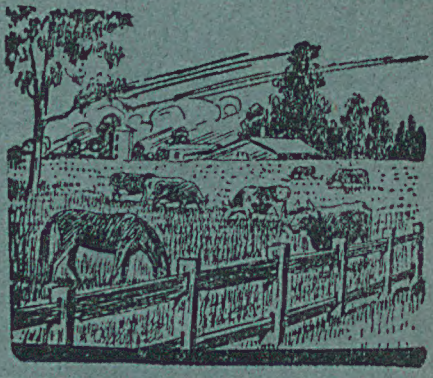

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THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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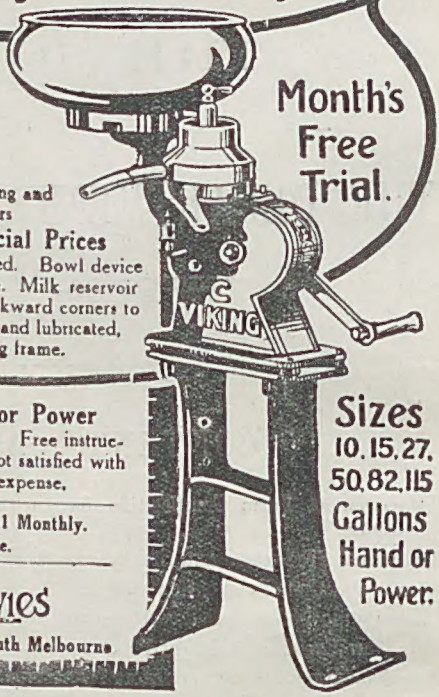

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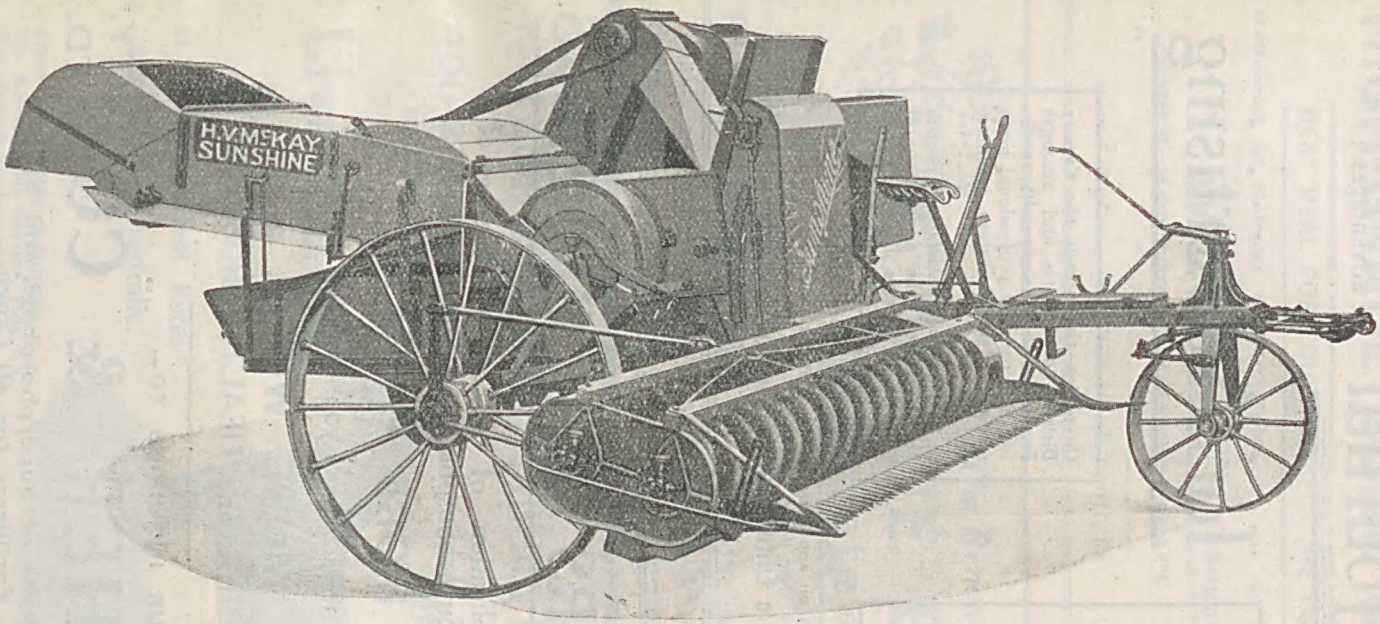

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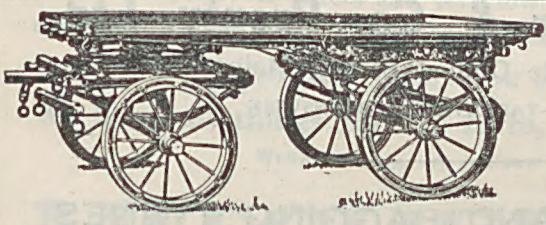

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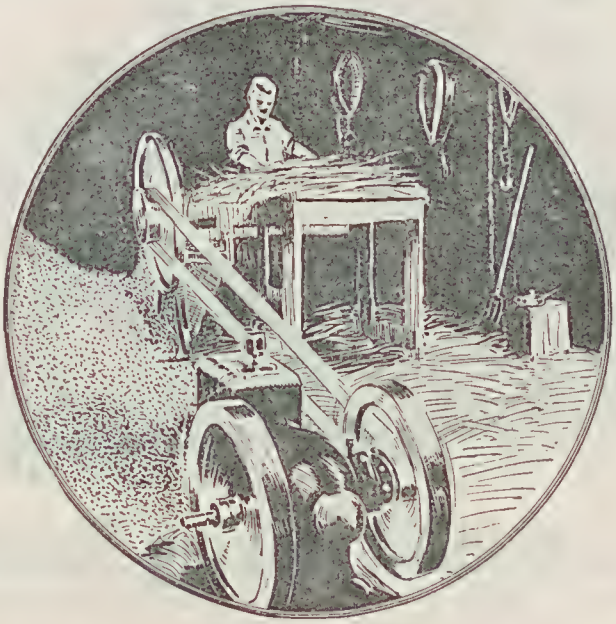

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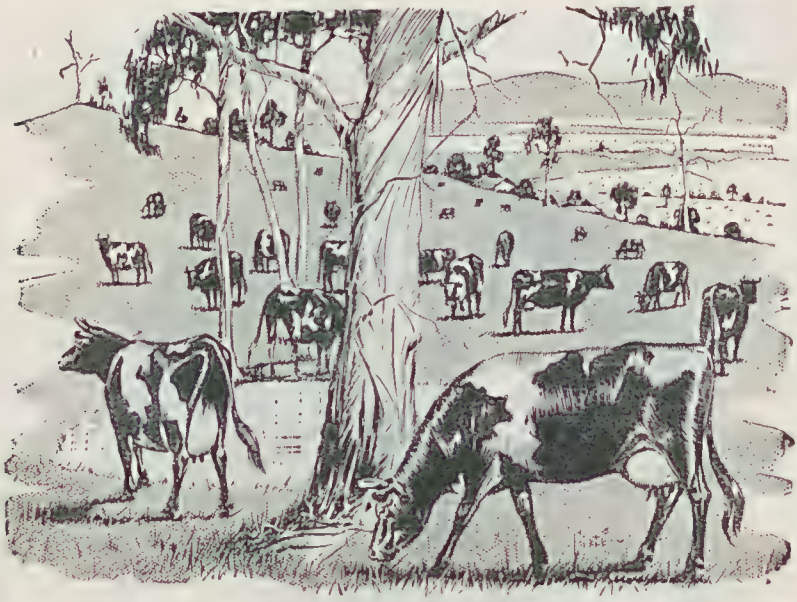

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THE JOURNAL

OF THE

Department of Agriculture

OF

VICTORIA.

Vol. XX. August, 1922. Part 8.

INTER-DISTRICT FARM COMPETITION FOR THE MALLEE.

ROYAL AGRICULTURAL SOCIETY'S THIRD COMPETITION (1921-22).—PRIZES £100.

Report of the Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer, Department of Agriculture.

Steward—J. Keane, B.Ag.Sc.

Hitherto the Royal Agricultural Society's Farm Competition has been confined to those members of local agricultural societies who won a prize in a current District Crop and Fallow Competition. That led to competition between farms in districts as fundamentally different as the Mallee and the Wimmera, with consequent difficulties in determining a fair basis of comparison. When the original rule was framed this disability was recognised, but as the Mallee farms then likely to enter were so few, it was not thought worth while to make special provision for them.

This year, however, the venue of the competition was changed to the Mallee, with the result that nine farms on Mallee land—prize winners in local crop and fallow competitions—were entered for the royal prize. The following districts, in which some mallee land occurs, were represented:—Beulah, Warracknabeal, Nhill, and Dimboola. Several of these districts are located on the mallee fringe, and it so happens that four of the competing farms are situated in areas where the actual change of timber from box and buloke to mallee occurs. In none of the cases, however, does the area which is not mallee constitute more than an inconsiderable proportion of the farm; hence, for

the purpose of the Competition, the farms were regarded as wholly Mallee.

JUDGING THE LOCAL COMPETITIONS, 1921.

The limitation for the time being of the Royal Competition to the Mallee has not resulted in any falling off of interest in the local competitions in the Wimmera. On the contrary, both in numbers of entries and in farms visited, there was a marked increase as compared with last year.

The following table shows the number of farms visited and entries judged:—

TABLE SHOWING DETAILS OF LOCAL COMPETITIONS CONDUCTED BY AGRICULTURAL SOCIETIES, AND JUDGED BY OFFICERS OF THE FIELD BRANCH, 1921.

District.	No. of Entries.	No. of Farms Inspected.	Type of Competition.
Nhill	75	27	Farm, Crop and Fallow Competitions
Rupanyup ..	53	27	Crop and Fallow Competitions
Warracknabeal ..	39	23	" " "
Minyip	20	15	" " "
Dimboola ..	29	19	" " "
Goroke	27	15	" " "
Horsham	17	11	" " "
Kaniva	32	10	" " "
Donald	24	17	" " "
Beulah	48	43	" " "
Benalla	4	3	Fallow Competition
Totals ..	368	210	

NOTE.—Some Mallee land occurs in the following of the above districts:—Nhill, Warracknabeal, Dimboola, Beulah.

In all there were 368 entries in the different districts, and 210 farms were visited. The judging took place during November and December, and occupied me fully for about five weeks, and Science Field Officer J. Keane and Field Officer I. M. Tulloh about three weeks each. Apart from railway journeys, about 3,000 miles of road travelling were involved. The whole of the cost of this was borne by the farmers themselves. Some 30,000 acres of wheat and 15,000 acres of fallow were subjected to careful investigation and classification. The exhibitors were closely questioned as to their farming methods, and complete records were taken. This information, correlated with the crop yields, was embodied in the form of reports furnished to each society for publication in the press. In many instances the societies have reprinted it in pamphlet form for distribution locally.

In districts where there are Government experimental plots, a Farmers' Field Day at the plots was held during the Competition, and the opportunity was taken of demonstrating the results of the experiments and of discussing local problems.

From the results of the local competitions a list of first and second prize winners whose farms were on mallee land was prepared and presented to the Royal Agricultural Society.

JUDGING THE ROYAL COMPETITION, 1922.

The farms of the nine competitors who qualified for entry were inspected in April and May. Points were allotted according to the scale set out in the table showing details of the awards—25 per cent. of the marks are given for the farm considered as a business. Special attention was paid to this aspect, and an accurate business analysis was made. From the Federal income-tax sheets the revenue and expenditure for each farm activity were determined. In addition, the land and improvements, plant and implements, live stock and fodder reserves were valued, in order to arrive at the capital investment. From these figures the profit was ascertained, and hence the "labour income," as well as the rate of interest earned on the capital. The "labour incomes," *i.e.*, what is earned after deducting 5 per cent. on the capital, were then compared according to a sliding scale based on the size of the investment.

An endeavour was made to determine these figures for the three-year period 1918-19, 1919-20, 1920-21 as in previous years; but as several of the competitors had acquired their farms within that period, this could not be done in all cases. The awards for business, therefore, relate to the year 1920-21.

TABLE ILLUSTRATING THE TYPES OF FARMING FOLLOWED BY THE VARIOUS COMPETITORS.

Name.	Area.	District.	Main Source of Revenue.	Average Area in—				Average No. of Sheep carried.	Cultivation, per cent. of total area.
				Wheat.	Oats.	Fallow.	Grass.		
	acres			ac.	ac.	ac.	ac.		
J. R. Kennedy*	968	Beulah ..	Wheat ..	400	150	400	18	20	98%
A. T. Couzner†	1,008	Beulah ..	Wheat and sheep	400	100	500	150	300	..
Schneider Bros.	1,280	Beulah ..	Wheat and sheep	400	300	400	180	130	86%
J. Bryant* ..	1,280	Beulah ..	Wheat and sheep	350	180	350	400	290	69%
W. T. Fish* ..	1,350	Beulah ..	Wheat and sheep	380	380	380	210	150	84%
C. F. H. Reichelt	1,350	Nhill ..	Wheat and sheep	250	130	250	720	200	47%
Geo. Coutts ..	1,360	Warracknabeal	Wheat and sheep	300	100	300	660	400	55%
C. A. Mibus ..	2,080	Dimboola ..	Wheat and sheep	600	200	600	680	300	67%
M. E. Schulz & Sons	3,270	Warracknabeal	Wheat and sheep	900	100	900	1270	800	58%

* These competitors have recently acquired improved farms in the district. The system given is the one they propose to follow.

† Rents 140 to 160 acres each year from September to December.

The areas of the competing farms ranged from 968 acres to 3,270 acres, but the majority averaged about 1,280 acres, or two square miles. Wheat, of course, is the main source of revenue, but is supplemented

in most cases by returns from sheep grazed on the stubbles and on land resting in grass.

While the proportion of land cropped on individual farms showed fairly wide divergences, the cultivation methods agreed closely and reflected most of the modern advances. A proportion of the land in most cases is summer-fallowed, the fallows are thoroughly cultivated, the quantity of seed used approximating 65 to 80 lbs., and the amount of manure used is from 80 to 120 lbs. From this it will be seen that the best farmers in the older Mallee are falling closely into line with the best Wimmera practices.

On the whole, the improvements compared favorably with the older settled districts, though in some cases a lack of careful planning was noticeable in the layout of the farm buildings. Almost in every instance the homestead was a comfortable one with a garden. In the house usually were to be found such modern conveniences as lighting system, piped water supply, cool cellar, telephone, and in one instance an up-to-date sewerage system.

Attractive Homestead of limestone and brick, of Mr. A. T. Couzner, Beulah, the winner of the Competition.

RESULTS.

The first place was awarded to Mr. A. T. Couzner, of Beulah. This farm showed all-round excellence, and the rate of interest earned on the investment during 1920-21 was good. The property consisted of 1,008 acres of undulating mallee country, but a further area of from 140 to 160 acres is rented for grazing purposes from September to December. Almost the whole of the home farm is cultivated. Usually about 400 acres are sown to wheat, 400 are fallowed, and 100 acres of oats are sown on late fallow, that is on land worked up immediately after harvest. The oats are then seeded much later than is the usual practice—an interesting feature. As a rule, a number of small home paddocks, totalling 30 acres, are sown to barley as forage for the dairy cows.

The fallows are carefully cultivated. Federation is the variety of wheat preferred, 65 to 80 lbs. of seed being used, together with 90 to 120 lbs. of superphosphate. The farm is well laid out. The water supply, of which the home dam of 6,500 cubic yards capacity constitutes an effective feature, is good.

The homestead is a substantial and attractive one of local limestone faced with brick. It commands a comprehensive view of the farm and the surrounding country. There is a neat garden. The farm buildings are conveniently arranged and, for the most part, solidly built. The fodder reserves and the live stock were satisfactory.

Messrs. M. E. Schulz and Sons, "Home Grange," Areegra, were awarded second place. This is a large farm of 3,270 acres, situated on the Mallee fringe, about 14 miles east of Warracknabeal. The most notable feature was the high rate of interest earned on the investment—a somewhat rare occurrence on a wheat farm of so large an area. The results obtained can be attributed largely to the fact that this farm is run by Messrs. Schulz and Sons on partnership lines—little or no hired labour being employed—and also to the special methods adopted for saving labour, of which more will be said later. On this property the best horses in the competition were noticed, and a further point of interest was the adoption of a system of seed selection for wheat similar to that practised at the State Farms. All wheat grown is the progeny of wheat continuously hand selected for improved yield.

The large farm owned by Mr. C. A. Mibus, situated a few miles from Antwerp, was notable for a most attractive home, orchard, and garden, and for systematic arrangement of the farm buildings. Liberal use of shade trees had been made about the homestead, entrance drive and buildings. Other features were a most up-to-date set of farm implements and an excellent water supply.

A competitor who scored most consistently in many departments was Mr. Geo. Coutts, of Batchica, Warracknabeal. The homestead is a comfortable one, replete in modern conveniences, including a sanitary system with septic tank. The farm buildings are substantial, though the stable is at present somewhat inconveniently located. The water supply to the homestead is derived from a well of sound construction. The homestead and paddocks are supplied by a convenient system of pipes, troughs, and dams. Mr. Coutts maintains a small stud of Merino sheep, as well as one of New Zealand Corriedales.

On this farm the local Government subsidy experimental field has been located during the past ten years. Mr. Coutts practises with success the lessons that they teach.

The remaining farms all had individual points of interest. Mr. J. R. Kennedy's farm has a fine modern home in a pleasant environment. Messrs. Schneider Bros. practise a rotation system, in which more than the usual quantity of oats is sown. Mr. C. F. H. Reichelt's cultivation methods are most thorough, and his farm buildings well planned and very solidly constructed. The main water supply is from a deep well. Mr. W. T. Fish, a newcomer to the Mallee, has a substantial homestead and farm buildings. There were ample supplies of hay, unusually well thatched and stacked. Mr. J. Bryant is also a newcomer to the Mallee and a returned soldier. His farm was not as highly improved as those of the other competitors, but he has made a satisfactory beginning, and

TABLE SHOWING SCALE OF POINTS AND DETAILS OF MARKS AWARDED.

Name.	Best Method of Cropping, Rotation, and Methods of Cultivation.	Character, Condition, and Value of Farm Crops.	Fallow.	Horses.	Sheep.	Cattle.	Pigs.	Poultry.	Machinery and Equipment.	Character and Arrangement of Farm Buildings.	Water Storage.	Fences, Gates, &c.	Fodder Reserves.	Trees for Shelter.	Orchard and Vegetable Garden.	Insurance.	Home.	Total.	Business.	Grand Total.
Maximum Points ..	**25**	**25**	**10**	**15**	**10**	**5**	**5**	**5**	**15**	**10**	**25**	**10**	**25**	**5**	**5**	**5**	**25**	**225**	**75**	**300**
A. T. Couzner	18	19	9	9	8	4	..	5	10	9	20	7	16	3	2	3	20	162	70	232
M. E. Schulz & Sons ..	17	21	9	13	7	4	2	2	12	7	17	7	16	2	2	1	16	155	74	229
C. A. Mibus	18	20	8	9	6	3	3	4	13	7	20	5	15	3	4	1	23	162	58	220
Geo. Coutts	19	18	9	9	9	3	3	4	11	7	21	8	17	2	2	1	22	165	33	198
J. R. Kennedy	18	20	7	6	7	2	2	2	8	6	17	6	17	3	4	3	19	147	45	192
Schneider Bros.	21	19	6	6	4	3	2	3	10	5	16	6	19	..	1	4	12	137	52	189
C. F. H. Reichelt	16	21	9	11	5	2	4	3	9	9	19	9	14	..	3	4	13	151	30	181
W. T. Fish	20	15	8	7	8	2	2	2	7	8	18	8	21	3	2	3	18	152	15	167
J. Bryant	16	18	8	8	5	2	..	3	7	4	15	5	22	..	1	2	8	124	10	134

one thing in which he outdistanced the whole of the other competitors was the extent of his fodder reserves.

These and other features of interest will be discussed in detail under the appropriate headings.

CROPPING METHODS IN THE MALLEE.

Comparison between these farms in the older settled portions of the Mallee and those in the Wimmera does not reveal many vital differences in the cropping methods and rotation systems adopted. Indeed, the tendency in the Mallee is to closely emulate Wimmera methods in detail, save in the matter of late sowing, and even here there are instances where that practice is also being adopted in the more southerly portions of the Mallee. The system followed by Mr. C. N. Mibus, of Katyil, near Antwerp, is a case in point. He finds that he secures the best crops on Mallee land by delaying his wheat sowing until the first week in June. Further north, however, one would doubt the wisdom of this practice; but the fact is that, through careless farming, the Mallee land

Seeding the Oat Crop on farm of Mr. W. T. Fish, Beulah.

is fast becoming so foul with weeds, that farmers are being forced to unduly delay seeding their wheat in order to destroy the persistent rubbish by successive cultivations.

One Wimmera practice which those in the older Mallee are begining to put into general use is the summer, or fifteen months' fallow. The experience everywhere is that by its means superior wheat crops can be grown; but where the land is dirty, and where crops require to be sown early, as they do in most of the Mallee, it has an especial advantage. By breaking up the land before the winter the autumn germination of the rubbish is secured at the beginning of the fallowing period instead of at the end. That means that on well-worked summer fallow the wheat may be sown in May, if necessary, with the certainty that it will be reasonably clean.

Messrs. Schneider Bros. and Messrs. J. Kennedy, W. T. Fish, and C. Reichelt all practise summer fallowing, though in the case of the latter it consists of burning the stubbles and lightly spring-toothing

the land only. Mr. Reichelt regards it as most important to bury the ashes of the burnt stubbles, and so prevent their dispersal by the wind.

One interesting departure from normal Mallee seeding practice was noticed in the Beulah district. In some instances as much as 100 lbs. of seed per acre are used, and from 80 to 90 lbs. is quite common. This is heavier than one would suppose necessary for the relatively early sowing practised in the district, if the results of the test plots at Longerenong, 75 lbs. best, are to be taken as any criterion. The fact, however, remains that some of the best farmers at Beulah have adopted the method after careful test. Messrs. Schneider Bros. have used increasingly heavy seedings during the past four years, and claim to have noticed correspondingly increased yields.

In 1919—a season of many drought failures in the Mallee—their crop was heavily seeded and liberally manured for the first time. A five-bag average was secured over 300 acres. The result was an effective reply to those who said that the heavily seeded and manured crop would burn off in a dry year.

Summer Fallowing with 12-furrow Stump-jump Skim-plough.—Mr. J. Kennedy's, Beulah.

Practically on every farm in the older Mallee some oats is now grown in rotation with wheat—generally on the wheat stubbles. As a rule, just as much is sown in this way as is required for hay purposes; but in some instances the whole of the stubbles are sown down. When that is done, the surplus is either disposed of as hay, or the growing crop is fed off to sheep. On the average for the nine farms considered 70 per cent. of the farm was cultivated annually to wheat, fallow, and oats, 28 per cent. being under wheat, 28 per cent. under fallow, and 14 per cent. under oats. These figures indicate that on Mallee farms 10 per cent. more of the land is cultivated annually than on Wimmera farms. On one farm the total area cultivated was as high as 99 per cent. and on one at the other extreme, 47 per cent. Recently, owing to the relatively high price for wheat as compared with sheep products, there has been a strong tendency for Mallee farmers to increase the area sown to wheat. That means a reduction in the number of sheep

carried; indeed, there was one competitor who kept no sheep other than a few killers. On farms where the conditions are comparable the profits, while prices are at present levels, appear to follow the increasing acreages sown. Of course, farmers who have been tempted by the relatively high prices for wheat to sow larger areas generally realize that the present system is in no sense of the word likely to remain a permanent one. They know that such a policy has the weakness of exposing the soil to a slow but steady drain on its fertility.

Few Mallee farmers as yet systematically grow oaten hay on fallow, though several sow a few acres that way for the purpose of getting good seed. The principal objection to the practice in the Mallee is the fact that when sown on well-worked fallow, oats ripen practically simultaneously with the wheat crop, resulting in a clashing of the hay carting with the harvesting. It is possible, however, that a compromise between the two methods cited will prove the solution of the problem—in other words, the oats will be sown on late fallow.

Mr. A. P. Couzner, the winner of the competition, regularly sows his oats in this way. The land to be sown to oats is worked up as early as possible, cleaned of weeds, and the oats sown after the first rain. If the quality of the hay stacked on this property is any criterion, the method has much to commend it. The resultant crop is cleaner and more bulky than the stubble oat crop, and it does not remain green for so long a period as one on fallowed land.

CROPS AND FALLOWS.

The fallows and details of the methods employed in growing the competition crops are fully treated in the reports of the district competitions furnished to the District Agricultural Societies and already published in the *Journal of Agriculture*. The most prolific crops submitted were those of Messrs. M. E. Schulz and Sons and Mr. C. F. H. Reichelt. The best fallows were those of Messrs. C. F. H. Reichelt, Geo. Coutts, A. P. Couzner, and M. E. Schulz and Sons.

LIVE STOCK.

Horses.

So far the breeding of high-class draught horses has not been practised to any extent in the Mallee, except in a few districts, notably in the fringe country near Warracknabeal, where the type of animal now used leaves little to be desired. In too many cases, however, Mallee teams of workers are an uneven lot, with a plentiful admixture of nondescript sorts showing evidence of light horse blood. To the critic of these it has become customary to justify their retention on the farm by claiming for them superior powers of pace and stamina under Mallee conditions. But those who have worked the modern Clydesdale of good breeding alongside them in the Mallee are under no misapprehension as to the relative value of each. The truth is that the half-bred horse is a relic of the pioneering days, where the hacks were pressed into place in the teams, and where any sort of horse was better than none at all.

In the greater portion of the district, however, those times have passed, and with them should go rough-and-ready horse-breeding methods. Mallee farmers should make greater use of those high-class Clydesdale studs that are available locally as well as in the Wimmera. If the job of replacing the nondescripts were systematically tackled,

an immense increase in the efficiency of the teams might be brought about, and from statistics gathered during the Competition it would appear that there is plenty of room for improvement.

Because the Mallee soils are light and easily cultivated, it is commonly argued that a team can put in a greater acreage of wheat there than in any other district; but the figures obtained, based on the number of acres sown and the number of working horses kept, fail to show that the Mallee teams have any advantage. Last year figures taken on seven representative Wimmera farms indicated that about 28 acres of crop (wheat and oats) were sown per horse. That also is the figure for the nine Mallee farms inspected this year. If the Mallee soils are easier to work, as undoubtedly they are, does it not appear that Mallee horses at present are not all that they should be?

The best horses exhibited were those in districts near the recognised breeding centres. Highest marks were secured by Messrs. M. E. Schulz and Sons, Warracknabeal, for their horses; Mr. C. F. H. Reichelt was next. Mr. Reichelt had some horses of excellent stamp, but the average ages were rather high. Marks were heavily deducted where sore shoulders and other remediable defects were noticed.

Sheep.

All the competitors but one had sheep. The apparent influence on the profits earned of the reduced number of sheep carried by some farms has been previously indicated.

A portion of Mr C. F. H. Reichelt's Merino Flock.

Under present conditions, both on Mallee and Wimmera farms of from one to two square miles in area, sheep do not appear to be an absolute economic necessity, either from the point of view of profits earned or from the aspect of farm management. But their presence is certainly desirable for soil-fertility reasons. On larger farms under existing labour conditions it is practically impossible to satisfactorily manage the wheat farm without sheep.

The Mallee is not Merino country—cross-breds are favoured, and in the older settled parts the fine-woolled types are preferred. The accepted practice is to buy a line of cross-bred ewes, breed freezer lambs from them for a few years, and then replace the ewes with a fresh line.

The New Zealand Corriedale is a breed that is becoming increasingly popular in the Mallee.

The highest award for sheep, nine points, was secured by Mr. Geo. Coutts, Warracknabeal. There are two small studs on this property—Merinos and New Zealand Corriedales. Mr. Coutts, after some considerable experience with the Merinos, is now replacing them with Corriedales. One objection to the Merinos is the dust, and another is the ease with which the dense Merino wool picks up the barley grass seeds with which the older Mallee is infested.

Mr. Couzner was awarded eight points for a very even line of Comeback ewes, which are mated with Lincoln rams. Mr. W. T. Fish showed 430 splendid Comebacks comprising 360 4-6 tooth ewes in lamb to Lincoln and Border Leicester rams, and also 70 Comeback wethers.

Other Cattle, &c.

Up to the present few Mallee farmers have paid much attention to the quality of their cattle, pigs, and poultry. But such is the attraction of pure-bred stock of the best class, that those who have the courage

Mr. A. T. Couzner's two fine Jersey Cows.

to purchase them will find a ready sale for the young progeny locally at enhanced prices. Apart altogether from the business aspect, the pure-bred animal engenders a special interest and pride on the part of those who have to tend them. Dual purpose cattle, such as Red Polls and the Shorthorn, appear the most useful types for Mallee conditions, if the numbers of young animals bred are likely to be considerable. Where the milk of one or two cows is the sole requirement, there is nothing better than the Jersey.

Mr. A. T. Couzner scored best under the heading of cattle with his two excellent Jersey cows. Messrs. M. E. Schulz and Sons had a good

Shorthorn bull, and a number of well developed young cattle. Geo. Coutts favours the Red Polls, of which he has a number.

None of the competitors had developed pig raising to any extent; but the advent of the self-feeder opens up the way for the Mallee farmer to a highly profitable side line which is not likely to make serious demands on his time. By means of this contrivance, crushed oats and barley may be automatically fed to the pigs, which thrive wonderfully well on the ration, practically from the time they are weaned. The crushed cereals are, of course, fed dry, the water supply being made available in a sparate receptacle. Where growing pigs also have access to a forage crop, such as barley or oats, as well, they fatten very quickly. Mr. Geo. Kerr, of Strathkellar, a well-known Berkshire breeder, installed the self-feeders last year with complete success.

In the majority of cases the poultry were of nondescript barnyard varieties, but Mr. Couzner had an excellent lot of White Leghorns of tested Wyuna strain.

The "Twin" type of Stump-jump Skim-plough (Messrs. Schneider Bros.)

MACHINERY AND EQUIPMENT.

The plant now used in the older Mallee districts is similar to that in the Wimmera, except in respect to the type of implements adopted for cultivation. Despite the fact that a good deal of the land has been farmed for thirty years, sufficient of the stumps of the original mallee still remain in the ground to render the use of the ordinary set type of ploughs and scarifiers impracticable. Though modern stump-jump machinery is well designed, in practice the evenness of the work performed leaves much to be desired, and this is often accentuated by failure on the part of the drivers to keep the stump-jumping mechanism in proper adjustment. The principal fault in this connexion is uneven distribution of the "draught" to the feet. This frequently results in several of the shears merely scratching the surface of the soil with their points. When this is the case the land cannot be regarded as fallowed satisfactorily, even though the surface may appear in good

condition. This disability should cause farmers on the older mallee land, in cases where the stumps have been materially reduced in numbers, to consider whether it would not pay them to systematically mark and grub the remainder. The idea is, of course, opposed to accepted Mallee traditions, but it would enable cultivation implements having a much more positive tilling action to be utilized.

There is little doubt that increased yields would result from the more effective cultivation that could be given, and it is possible that they would soon pay for the cost of the grubbing, and leave a substantial profit besides. The point is worth testing.

Much of the fallowing is now done with the heavy type of "cultivating" stump-jump scarifier—one of the most effective implements yet introduced into the Mallee. This is made in two styles, one "straight" with the feet set one behind the other diagonally across the machine, and the other "twin" with the feet set in two parallel diagonal rows.

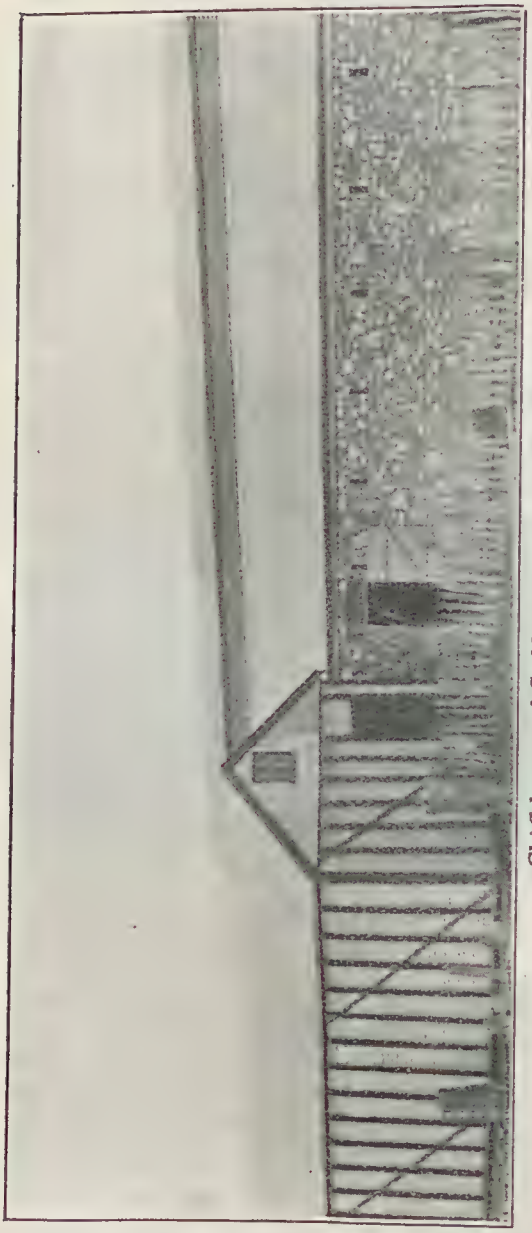
An effective type of 12-furrow Stump-jump.

The "straight" type is the most popular where the surface of the land is reasonably level, but the twins are preferred in crab-holey country.

For working over the land after fallowing, the spring-tooth cultivator and stump-jump harrows are generally used. With them it is, of course, necessary to kill weeds while they are still small. Disc cultivators are rarely used except to chop up "paddy melons" when they infest the fallow. Headers and reaper-threshers are rapidly displacing the combined harvesters, while strippers are rarely used at all. The combined spring-toothed cultivator-drill, too, is steadily ousting the ordinary seed drill.

The business survey disclosed that the amount of capital invested in plant and implements on the nine farms inspected ranged from £610 to £1,600, and averaged £1,120, equal to 7.7 per cent. of the average capital investment. This is no inconsiderable sum, and it must be admitted that, if an investment of this order is required for implements

and machinery on the Mallee farm, then the purchase of plant represents a crushing burden for the new settler. But he would not require such an elaborate plant as here indicated. Indeed, many of the machines, such as harvesters, are quite unsuited to new Mallee conditions, especially where there are loose sand hills. In any case, the values quoted are inflated by the recent purchase of costly implements of the very latest and largest size. While this progressive spirit is commendable in securing the highest labour efficiency, the installation of new machines can readily be overdone; for on some of the farms are to be seen combined harvesters and seed drills which have been discarded while in perfect condition, without regard to the present difficulty of obtaining a satisfactory price for them second hand. In installing a machine it is not good business to lose more in depreciation than is gained in efficiency. This machinery, together with strippers, is available to the new Mallee settler who is a keen buyer, or to one who can obtain sound advice.



Chaff-house and Stable at Mr. A. T. Couzner's.

On most of the competing farms the provisions for repairs to machinery was surprisingly poor, and some slackness was noticed in the maintaining of the plant in perfect condition —the stump-jumping machinery is here specially referred to.

Mr. C. A. Mibus was was awarded highest marks for his plant. It consisted of one 9-ft. Taylor header, three 5-ft. combined harvesters, two 6-ft. binders, three waggons with broad tyres, four stump-jump ploughs, three combined drills, one spring-tooth cultivator, three scarifiers, thirteen leaves of harrows, two chaff cutters, one oil engine, 6 h.p., wool press, &c.

The Mallee competitors did not appear to show the same inventive ability which characterized several of those who entered in the Wimmera inter-district competition last year.

FARM BUILDINGS.

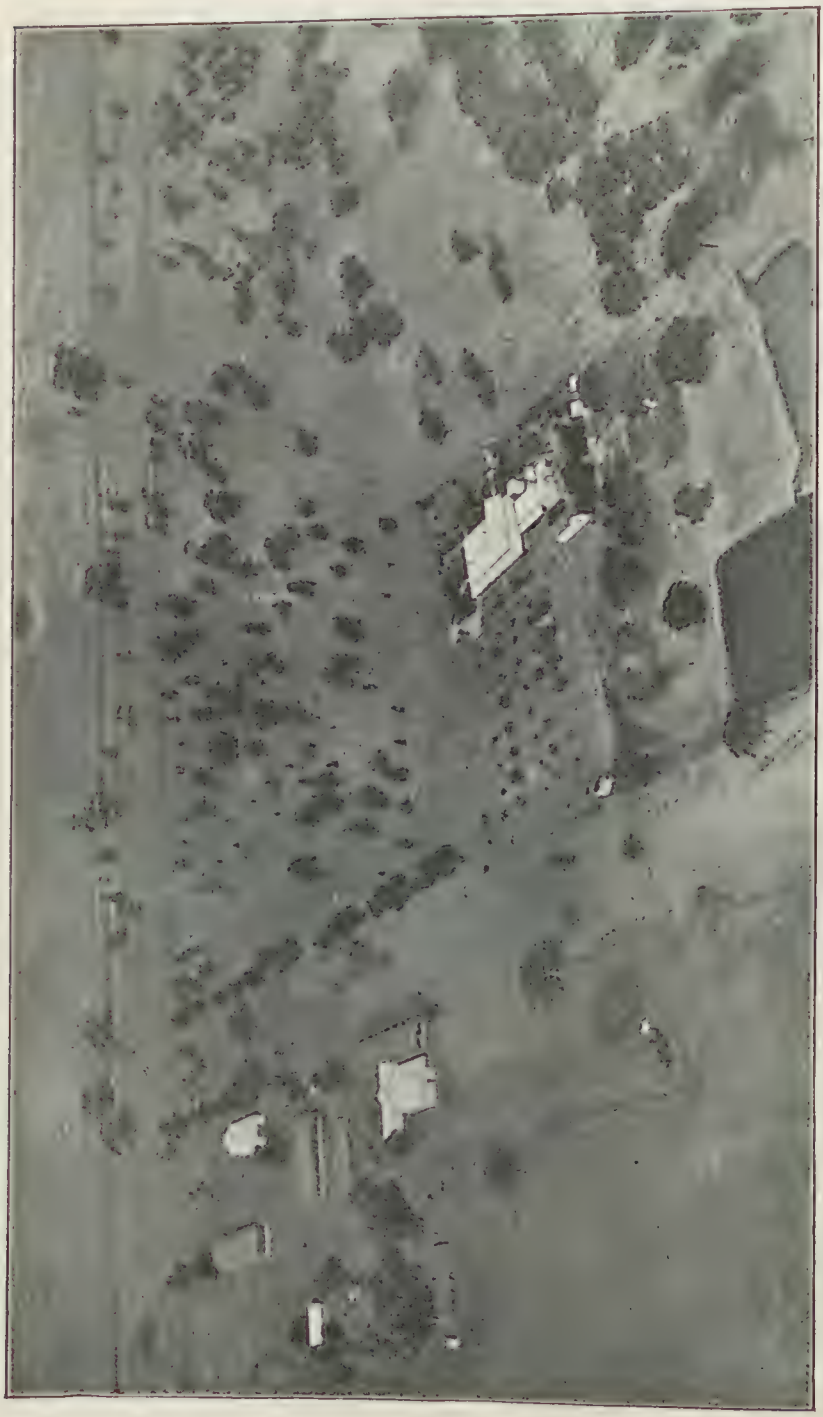
The principles which govern the effective lay-out of the farm buildings have been discussed in previous reports. Briefly, the more important requirements of farm buildings on a wheat farm are—

1. Effective feeding and stabling of each working horse.
2. Efficient handling of hay from stack to chaff-cutter, and thence to store and horse.
3. Protection from weather, animals, birds and vermin, of stored foodstuffs, and protection of any implements liable to deterioration from weather and damage from animals.
4. Provision for rapid and effective repairs to implements.
5. Ventilation and coolness of buildings in summer.
6. Moderate cost, durability, and accessibility.
7. Provision for catchment and storage of rain water from roofs.

Stable built of local Limestone (Mr. A. T. Couzner, Beulah).

In judging the farm, these points were considered, together with the relation of the sites of the buildings to the homestead and the farm as a whole. Attention was paid also to drainage, and the condition of the road surfaces about the buildings. Importance was attached to accessibility from the buildings to main roads and paddocks.

Of the several plans on which buildings may be arranged, perhaps the best is the open square design. Here the principal farm-steading is grouped about the four sides of a hollow square. All uncontrolled stock should be kept out of this area, which may then be maintained as a well grassed farm yard. Such a plan largely obviates the dust nuisance in summer, and in the winter mud is reduced to a minimum. Those buildings, such as stable, chaff house, &c., where ready access from one to the other is required, are, of course, placed close together. The horse-yard is kept separate from the farm-yard. On the whole



Aeroplane Photograph showing Homestead and Farmsteading, Water Supply, &c. (Mr. C. A. Mibus', Antwerp).

the buildings seen, though often of solid construction, were rather poorly arranged. The most substantial were those of Mr. C. F. H. Reichelt, and the most effective arrangement that of Mr. Couzner. Mr. C. Mibus had all his buildings carefully aligned. Mr. Reichelt's principal buildings, constructed of bush timber and iron, were of thoroughly workmanlike design. The eighteen horse stable is of the dome-roofed type open to the east. The horses all face the one way. The stable is 78 ft. x 25 ft., and the contiguous chaff house 42 ft. x 25 ft. The barn was of iron, 55 ft. x 20 ft. It was not of the mouse-proof type. The implement shed, also of iron, was 24 ft. x 60 ft. In addition there were well built cow sheds, smithy, store, and men's hut.

Mr. Couzner's stable furnished an interesting illustration of neat construction in limestone. The limestone spalls were quarried on the property, roughly faced on one side, and grouted in cement. Bricks were used for facing the corners, doors and windows. Buildings of this type are very common in South Australia, but have little vogue here,

A 6,000-yard Dam of excellent construction, with limestone water-chute (Mr. A. T. Couzner, Beulah).

even in parts of the Mallee where limestone exists in quantity. While at the present time they are no cheaper to construct than wood and iron, their coolness in summer and their more attractive appearance are worthy of consideration.

WATER CONSERVATION.

The well designed public stock and domestic water supply system, the ramifications of which cover the greater part of the Mallee, has done much to render settlement there permanently prosperous, but the extent to which the benefits are enjoyed by the individual farm depends largely upon the enterprise of the farmer himself. On many farms in the Mallee the capacity of the storage provided is still inadequate. Even in a year of normal rainfall, it is not uncommon for all of the dams except the large one at the homestead to dry out in the summer. In drought years, of course, this, too, is almost certain to fail as well, and water carting has to be resorted to. Nothing disorganizes farm routine

so much as water carting. Neither can a garden be maintained, nor an unfailing supply provided for household purposes, without reasonable storages. For a quarter of an acre of garden and for domestic purposes, the main dam should be at least 4,000 to 5,000 cubic yards, though with extreme economy 3,000 yards has sufficed. 10,000 cubic yards is an ideal to be aimed at. With wells or bores, however, there is not the same necessity for large storages, though water from this

Excavating a 5,000-yard Dam at Messrs. Schulz Bros.', Warracknabeal.

A well-constructed Dam (Messrs. M. E. Schulz and Sons, Warracknabeal).

source is frequently mineralized and hence not entirely suitable for house and garden.

In the paddocks dams of at least 1,000 yards capacity should be aimed at; if less than that they are liable to give out at critical times. An economical method of watering paddocks where it is practicable is to place the dam at the junction of intersecting fence lines. Apart from the capacity of the dams, care should be exercised in their construction.

They should be relatively deep, in order to present the minimum surface to the air, thus reducing evaporation, which is usually from 4 to 5 feet a year. If the excavated dirt is placed regularly round the dam, it acts as a breakwind and helps to further check evaporation. Dams should therefore be at least 12 feet deep, with sides as steep as the scoop horses can negotiate. The dam should either be fenced and mill provided, or a paved stock approach laid. Settling pit and chute of material not subject to erosion by the water are necessary. Chutes may be made of galvanized iron, sacking, but preferably of concrete. Where horses and cattle are permitted access to a dam, or where the corners are allowed to erode, rapid silting occurs. Apart from the

A Death-trap: Sheep caught in the mud in a silted dam.

reduced capacity of the dam, the silt is a death trap to stock when the water gets low.

The following table illustrates the varying storages provided by the competitors. About 10 to 15 cubic yards per acre, even where backed up by bores or wells, appear to be essential for safety and economical working of the farm.

Competitor.	Area of Farm.	Water Stored in Dams.	Source of Permanent Supply.
	acres.		
J. R. Kennedy ..	968	7·1 cub. yds. per ac.	Government channels
A. T. Couzner ..	1 008	11·3 ,, ,,	,, ,,
Schneider Bros. ..	1,280	6·3 ,, ,,	,, ,,
J. Bryant ..	1,280	6·9 ,, ,,	,, ,,
W. T. Fish ..	1,350	8·3 ,, ,,	,, ,,
C. F. H. Reichelt*	1,350	11·0 ,, ,,	Well, 180 feet deep
Geo. Coutts* ..	1,360	13·0 ,, ,,	Well, 88 feet deep
C. A. Mibus ..	2,080	8·1 ,, ,,	Government channels
M. E. Schulz & Sons	3,270	6·6 ,, ,,	,, ,,

* The well here has been computed as equivalent to dams of 6,000 cubic yards capacity.

On the farms of the majority of the competitors windmills have been installed and a pipe water supply was available at the house, stable and garden. Mr. Geo. Coutts was awarded highest points (21) under this head. The central supply at the homestead is obtained from a well 88 ft. deep of sound construction. The water from this is elevated by a mill to a 5,000 gallon tank on a well made stand. Thence it is distributed by pipes to wash-house, bath-room, garden, and three iron troughs provided with ball stop-cocks. The paddocks are otherwise well watered by means of effectively placed dams and there is a frontage to the Yarrambiac Creek.

Mr. C. F. H. Reichelt was awarded 20 points. In this instance the main supply was also by a well some 180 feet deep. This well was of most approved construction, being timbered with red gum, and provided with a "chamber" and "box". The 12-ft. mill is erected on a

Finishing the Thatch (Mr. J. Bryant's, Beulah).

30-ft. tower. The tank is 4,000 gallon capacity, and is on a stand 10 ft. high.

Mr. A. T. Couzner also gained 20 points. The chief feature of interest was a 6.500 yard dam of good type, well banked, and provided with a chute of limestone and cement. The outlying dams were of large size, and well placed with a view to serving several paddocks.

Messrs. M. E. Schulz and Sons had a number of large dams, either in course of construction or just completed. They were of the best style.

On one farm it was noticed that a number of sheep had perished in the mud in a silted dam in which the water was low.

FODDER RESERVES.

All the competitors had satisfactory reserves of hay which, almost without exception, had been more or less roughly thatched, and which were enclosed with iron with a view to mouse-proofing them. Some competitors had accumulated very large supplies indeed, with the definite objective of turning them over at a big profit during the next drought.

For the most part the hay was of Algerian oats. Where it was wheaten a prevalent fault was the presence of over-ripe grain. Oaten hay grown on fallow was of notably better quality than that cut from the usual stubble sown crops.

The style of stacks built leaves much to be desired, but Mr. W. T. Fish, who has recently arrived in the Mallee from Cobden, set the other competitors a high standard in this respect. His stacks were models of symmetry, and when opened showed practically no wastage because they were stacked with the object of turning water. Mr. Fish remarks with evident truth that it is just as easy to build a good stack as a bad one. He emphasizes the necessity of keeping the stack "well hearted up" from the start; this will give the stack the natural "spring" so well exemplified in all the stacks to be seen on his property, as well as give each sheaf in the stack the downward cant that protects it against penetration by water. In placing down the first layer Mr. Fish works

Well-built and effectively-thatched Stacks (Mr. W. T. Fish's, Beulah).

round the stack say from left to right; he alternates the direction the next layer, and so one until the stack is finished. Sheaves at the edges are placed slightly inside the lower layer, but subsequently are pushed out by the natural spring. Each sheaf is knelt on. On the sloping roof the sheaves are kept fast by deftly engaging portion of the straw of one sheaf with the band of the sheaf lower down.

It was noticed that several of the iron enclosures had been penetrated by mice and also burrowed underneath. In other cases the enclosure had been erected after the stack was built. The iron should be placed in the ground at least 6 in. deep, and care should be taken to tamp the soil well and inspect it occasionally. Where mice had entered the stack the provision of kerosene tins filled with water and placed level with the ground at the corners were noticed to be fairly effective in catching mice.

Mr. W. T. Bryant was awarded 22 marks out of 25 for fodder reserves. He had 400 tons of hay, thatched and mouse-proofed, as well as 100 bushels of oats.

Mr. W. T. Fish had 300 tons of excellent oaten hay and 100 tons of straw. He was awarded 21 marks under this head.

THE FARM HOME.

It is satisfactory to note that public opinion in the Mallee is gradually casting aside the old tradition that it is a place where the physical discomforts are so great that they can be endured only for the purpose of making a fortune sufficiently large to enable an eventual retirement to be made to a more pleasant locality.

To-day it is recognised that this idea sprang from the primitive conditions which limited capital forced the early pioneers to endure, and further that it disappears when attempts are made to improve the farm environment and the general comforts and convenience of farm home life. The influence of improvements of this sort is at last producing a race of Mallee farmers whose instincts are to remain permanently in the district.

Comfortable Mallee Homestead, sheltered by sugar gums (Mr. J. Kennedy's, Beulah).

The reason for the comparatively slow development of local sentiment in this direction is probably due to the many natural obstacles that must be overcome before the farm surroundings can be made attractive, or the farm home rendered comfortable. In the first place the natural mallee scrub left as shelter belts about the farm buildings soon becomes unkempt; then the soil about the homestead is readily churned up by traffic into loose sand, which blows about and becomes deposited about fences, buildings, &c. No garden can be grown unless a piped water supply is available, and young trees need careful attention during the first year or two of growth.

Houses are hot in summer if designed according to southern standards, and easily rendered uncomfortable by dust and flies unless special precautions are taken. Further, sufficient water for domestic purposes will not always be available unless special provision is made for it. Then again there is the isolation of the farm-houses, each separated by a mile or more.

But that these disabilities can be readily overcome has been demonstrated in scores of instances by progressive Mallee farmers who have paid the matter some attention. Almost the whole of the competitors had comfortable homes located in surroundings as pleasant as any in country districts. Mr. C. N. Mibus, of Katyip, near Antwerp, was awarded 23 out of a possible 25 points under this heading. His home is a substantial one, cool, well ventilated, and provided with extensive verandahs with sleeping-out accommodation. Up-to-date conveniences, such as lighting system, telephone, fly-proofing of doors and windows, cool cellar, piped water supply to kitchen, bathroom and washhouse, and laundry have been installed. The house was located in an attractive garden containing well-grown palm trees, ornamental shrubs, roses, &c. Near by was half-an-acre of orchard. It was well set back from the road, and is approached by means of a straight drive, planted with young sugar gums. The drive was flanked on either side by a well-grassed paddock, containing shade trees and bordered by handsome sugar gums. The aspect from the home was good. Near by was a large dam equipped with springboard, and adjacent was a tennis court.

Residence of Mr W. T. Fish, Beulah.

Mr. Geo. Coutts was awarded 22 points. His homestead is situated in a position commanding an extensive view at the head of a planted drive. The rooms were large and airy, and verandah accommodation good. Telephone, piped water supply, and lighting system had been installed. A feature also was an up-to-date sanitary system with water cistern and septic tank, the cost of which, Mr. Coutts stated, had not exceeded £70. Such an expenditure could be met by most well-to-do farmers, and there is no reason why this improvement should not be standard equipment for practically every farm.

Mr. A. T. Couzner was awarded 20 marks. The house was a large one of faced limestone spalls and brick. All modern conveniences were in evidence. The environment could be improved by more extensive tree planting.

INDIVIDUAL PRODUCTION AND THE AVERAGE TEST.

By W. J. Yuill, Dairy Supervisor.

Every advanced system of dairy farming teaches the necessity for knowing each cow as an individual. This is necessary, because of their varying temperaments, and the unequal quantities of food required by different animals and their varying capacity to produce milk of a high butter-fat percentage. Sufficient feeding of approved quality is an essential principle in every system. Successful dairying demands sufficient feeding at all times, and when the requisite feed nutrients are combined with succulence, as provided in abundant clover pasture, ensilage with added concentrates, or similar feeding, a maximum milk flow is assured.

Too many dairy herds are being milked on pastures that are insufficient for store stock (except, perhaps, for a period during the flush of spring grass). Half rations of inferior food are only too common. Any attempt to ascertain the producing capability of a cow, unless she be receiving all the feed she can consume (which should contain those nutrients so essential to milk secretion) is doing her an injustice. It would be just as rational to expect full power from an engine on limited supplies of fuel. Only when a cow is receiving full feed supplies will the scales and milk chart record her real capability. Simple addition of daily milk weights will give the year's milk production and offers no problem. But around the average test many fallacies and errors have grown up.

There are yet to be found many dairymen who do not understand the meaning of the word "test," or the principle of testing milk for butter-fat. "Test" is simply a term meaning percentage of butter-fat in milk. A five-test cow is one giving 5 lbs. of butter-fat in every 100 lbs. of milk produced; likewise a 4.6 test means four and six-tenths lbs. of fat, and so on. The terms "butter-fat" and "butter" are not synonymous—butter-fat being the pure fat of milk, whilst butter is an article consisting of butter-fat, salt, curd, and water in fairly definite proportions—6 lbs. of butter-fat making approximately 7 lbs. of commercial butter.

It is still commonly believed that the test of a cow during her first lactation period, will be the lowest, and is, therefore, no indication of what it will be in later years. Further, that a cow's test varies from year to year, and that the test can be altered at the will of the feeder, *i.e.*, that feeding foods, rich in protein, such as linseed meal, polly meal, bran, and similar foods, will increase the test, and, inversely, that feeding hay or green fodder or grazing pasture grasses will lower it. This statement is sometimes used to explain the high average test of the leading herds in the Government herd test, and also the relatively poor test of many farmers' herds. Again, the statement is often heard that cows test higher in summer, and during mild temperatures, and that the test is lower in winter and during cold and wet conditions.

Of course, there are passing influences which affect the test, such as excitement (sexual or otherwise), sickness, imperfect milking, unduly severe weather conditions, or a drastic change of feeding, but a normal average test soon returns. It is generally admitted that it is impossible to increase and maintain the butter-fat percentage by any known system of feeding. The use of concentrates, together with maintenance of good condition in milking cows, may, to some slight degree, increase the percentage of butter-fat above that yielded by the same herd when dependent on pasture grasses only. But no definite relationship exists between the test of an animal and the feed digested, the test of an animal being part of her individuality, just as much as is her colour or temperament.

A perusal of any annual report of Government herd tests will show that in every herd there are animals whose test varies greatly, and this even after a herd has been heavily culled for years. It will be found that with similar feeding Jerseys, Ayrshires, or Friesians will, on the average, secrete milk of a butter-fat content characteristic of their breed. Feeding will increase the milk yield, but breeding alone (if it be on right lines) will surely increase the average test.

These and other theories are held by many dairymen. In some instances testing is neglected, owing to the apparent instability of the average test. Haphazard testing would appear to prove that a cow may yield milk of a certain test one year, and of quite a different one the following year. Cows have been purchased with a reputed high test, and disappointment has followed at the disparity between the reputed test and that taken after a subsequent calving, possibly the only difference being the stage of lactation at which the tests were made.

The increasing interest indicated by the formation of testing associations in different parts of the State shows that dairy farmers are awakening to the fact that pounds of butter-fat produced per annum, and not an odd test, is the only true indication of merit. Probably greater interest would be shown if it were more generally known that a cow's normal average test is approximately the same from year to year (therefore a low-test cow can never become a high-test cow), and her test can be ascertained during the first milking period. This being so, it follows that a heifer that proves an indifferent milker, with a low test, should be disposed of for beef while still a young cow.

Dairymen are now giving more attention to securing cows with a good test. Increased competition for cows with reputed high tests is a common illustration of this fact. At a recent clearing sale an out-of-season cow was offered, and, although a good typical dairy cow, bids came slowly until it was mentioned that she was a 6 per cent. test. Immediately the price advanced—eventually reaching a good figure—her reputed test being responsible for the increased demand.

A cow yielding 25 lbs. milk of a 6 per cent. test daily will be producing less butter-fat than one secreting 40 lbs. of 4 per cent. milk. In the case quoted the test given may have represented the average normal test for the year, or it may have been far from it.

In taking a sample of milk for any period care must be observed that it is a representative one. The common practice is to take a composite sample from several successive milkings, an equal amount being put into the sample from the smaller weight of usually higher testing evening milk as compared with the morning milk. Generally no allowance is made for the fact that the butter-fat percentage increases with the period of lactation; so much so, that a test taken early in the milking period may differ from one taken late in the year to the extent of 2 per cent. or more. For instance, a cow with a 4 per cent. test early in her lactation may secrete milk yielding 6 per cent. of butter-fat during the latter part of the milking season.

As there are in most herds cows in varying stages of lactation, injustice will be done to newly-calved cows if the test of milk (instead of the production of butter-fat per annum) is the accepted method of comparison. Not only does a cow's test vary from month to month, and from morning to evening, but should a sample be tested from milk drawn at noon, it may also vary.

In the home-milking competition in Queensland last year, the imported cow "Larkspur" yielded as follows under official test:—

	Fat.
16 lbs. of milk at a 4.5 test at the morning milking ..	·65
13 lbs. „ „ 5.0 „ „ noon milking ..	·72
16 lbs. „ „ 5.2 „ „ evening milking ..	·83
45 lbs of milk	2·20

The composite average for the day was 4.9; the total fat for the day was 2.20 lbs.; 4.9 per cent. of 45 lbs. of milk. All this shows that there is nothing stable about a cow's test, and how unreliable may be the figures so often quoted at sales. In addition, it emphasizes the need of knowing under what conditions the test was taken, for nothing is more certain than that any one test can only represent a short period at about the time the test was made, and may in no way represent the normal average test for the year.

The following monthly tests of a noted cow, tested under official conditions, approximately represents the average cow, and will serve to show how misleading any one test may be:—

Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
4.82	5.20	4.39	4.76	5.51	6.07	5.94	6.39	6.41

This cow's composite average test for the year was 5.32. Her milk production was 10,850 lbs., and 576.91 lbs. of butter-fat, the butter-fat being 5.32 per cent. of the milk.

To secure a composite average test, it is necessary to know the weights of milk and the amount of butter-fat (whether it be for a day or for a year). The definite percentage that the total fat is of the total milk can be the only true test, and this composite average test remains approximately the same from year to year.

Appended are some records of cows tested under departmental herd test conditions for a number of years. They are typical of the average cow, and approximately represent the various breeds. These records chosen at random can be multiplied by any one who will turn up the

back numbers of the September issue of the *Journal of Agriculture*, which contain the annual report of the year's herd test work. The variation between one year and another will be found in most cases to be approximately half of 1 per cent.; it rarely exceeds 1 per cent.:—

Year of Test.	"Daisy" of Springhurst.	Lady Grey V. of St. Albans.	Jessie VI. of Melrose.	Fuchsia of Warrook
1912–13	5·50	..	..	..
1913–14	5·80	5·62	5·67	..
1914–15	5·34	5·61	5·59	..
1915–16	5·23	5·11	5·69	4·46
1916–17	5·39	5·38	5·32	4·16
1917–18	5·54	5·37	5·50	..
1918–19	5·67	..	5·35	4.23
1919–20	5·06	5·43	..	..
1920–21	..	5·60	6·05	4.39
Variation	·74	·51	·73	·30

Year of Test.	Muria of Department of Agriculture.	Bolobek Isabella.	May Queen II. of St. Albans.
1912–13	..	..	..
1913–14	5.00	..	..
1914–15	..	..	..
1915–16	5·74	..	..
1916–17	5·43	..	..
1917–18	5·57	3·63	4·37
1918–19	5·42	3·52	4·59
1919–20	..	3·60	4·75
1920–21	..	3·36	..
Variation	·74	·27	·38

Sufficient evidence is procurable to prove beyond all doubt that the average test remains approximately the same from one year to another, and the only way to secure a correct record of annual production is to weigh daily and test periodically. It is essential to know each cow as an individual. Haphazard testing, and a composite record of two or three days at mid-season, can never be satisfactory, for it may have no relationship to an animal's actual worth. The high producer in spring is often dry when the consistent milker is still doing well. No true estimate of a cow's worth can be ascertained without a record of the annual milk yield and of her composite average test.

Any system of recording is better than absolute apathy. For the man who cannot find time for daily weighings, there are several short cuts which will give sufficiently correct results to enable the dairy farmer to cull his unprofitable cows, and to indicate from which cows he should breed the future members of his herd. One system which

involves a minimum of labour is to weigh the milk one day a month, and to test a composite sample of the night and morning milk, accepting that day's weight of milk and test to represent the period of a month, as in the following illustration:—

Month.	Lbs. of Milk Daily.	Lbs. of Milk for Month.	Test.	Lbs. of Fat for the Month.
July	20 x 31	620	3·4	21·08
August	25 x 31	775	3·5	27·12
September	30 x 30	900	3·3	29·70
October	35 x 31	1,085	3·4	36·89
November..	33 x 30	990	3·5	34·65
December	30 x 31	930	4·0	37·20
January	22 x 31	682	4·3	29·32
February	15 x 28	420	4·8	20·16
March	10 x 31	310	5·0	15·50
April	5 x 12	60	5·3	3·18

Lbs. of milk for year, 6,772; lbs. of fat for year, 254·8.

The average of the monthly tests will be found to be 4.05. But the true test for the year can only be the percentage that the total fat is of the total milk secreted during that period. In this instance it would be $\frac{254.8 \times 100}{6772} = 3.785$.

The number of milking associations which have been formed during the last two years indicates that dairymen are realizing that odd tests are no longer satisfactory, and that they desire to know the amount of butter-fat each cow is producing annually.

The average production of butter-fat per cow in Victoria is said to be about 160 lbs. There are herds making very little over 100 lbs. of fat per cow, and there are herds making over 400 lbs. per cow. Feeding will account for a great deal of this difference, but culling out the unprofitable cows, and grading up by keeping the heifer calves from the best cows, together with the use of bulls from tested dams, also largely help in the general improvement.

With the reduction in the price of butter-fat, and the higher standard of living, no dairyman can afford to let the years slip by without utilizing one of the many ways of putting each cow in her true position in the herd. No better way of obtaining this information can be suggested than the formation of local testing associations. Where there are, at least, twenty-five or thirty dairy farmers in a district, they should be able to form such an association. It would, of course, be necessary to obtain the service of a competent person to perform the work, but where a number of farmers co-operate the yearly cost to each would be comparatively small.

WEEDS AND THEIR ERADICATION.

(Continued from page 414.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

The Blackberry or Bramble, *Rubus fruticosus*, L., Rosaceæ.

In southern Victoria the Bramble or Blackberry is rapidly becoming one of our worst pests, and, it is already proclaimed under the Thistle Act for the whole State. It is too well known to need any description, both on account of its numerous fruits, and its aggressive and persistent hold on the places where it has been allowed to establish itself.

Unfortunately, on account of its fruitfulness, it is often allowed to grow undisturbed, or until after its fruits have been harvested. In fact it is very largely due to the value some people place on these berries that this plant is now becoming so very widely spread. That the fruit is permitted to ripen gives the blackberry tremendous possibilities of becoming one of our worst pests. The fruit is also eagerly sought after and eaten by many species of birds and animals, with the result that its seeds are being scattered over very wide areas, which were, until recent times, comparatively, if not quite free of it.

The blackberry is an introduction from Europe and Asia, and like most other introductions, has entered this country free from controlling agencies, and, further, its spread is being facilitated by the assistance given to it by introduced birds and animals, as well as by those indigenous to this country. Many birds eject from the mouth indigestible remains of food; this usually consists of the hard parts of insects and seeds of blackberry when the latter is in season. This seed ejectment is one of Nature's methods for seed dispersal over wide areas. Animals also assist in the spread of this plant by feeding on the ripe berries, the seeds of which, after passing through the digestive tract, remain viable.

The blackberry, in addition to its many bad qualities, affords ideal cover for rabbits and other vermin, besides often making the banks of rivers and creeks inaccessible of approach. It is also responsible for the death of sheep. The writer has seen several instances where these animals have lost their lives through becoming hopelessly entangled among the looping brambles, and so dying a miserable death from starvation.

Though the spread of the blackberry bramble to clean areas is mostly due to its seed being carried there, in established clumps its increase is usually due to the long arching or trailing brambles becoming rooted at the tips, and by these means commencing the formation of a fresh clump, which, unless checked, will ultimately become merged into one tangled mass. Fig. 45 gives an example of a typical arched bramble that has fallen over and become rooted at its tip.

Blackberries have a perennial rootstock without underground creeping shoots, and their propagation is usually by the means above mentioned.

One of the first steps towards blackberry control should be to prevent this plant from fruiting wherever possible. This could be accomplished either by cutting down the brambles, burning them, or by spraying the bushes with chemicals.

On cultivable land there need not be such very great difficulty in blackberry eradication. If the clumps or masses are old established, these should first be cut round by means of a horse-drawn mowing machine, or else cut with a slasher. The cut material should then be thrown back on to the mass of uncut brambles and left until fairly dry. Some free-burning material, such as bushes or straw, should be added so as to insure a good burn. If the burn is not a good one by reason of insufficient material, the brambles are merely scorched and toughened, and are then more difficult to cut than they were previous to being fired. If there has been a good clean burn, the roots can be completely dug out and burnt, or the land can be ploughed during the warm weather, and often enough to prevent any new shoots arising, and thus feeding any rootstocks remaining in the ground.

Repeated cutting of new shoots will starve the rootstocks, ultimately killing them, but cutting to be effective must be frequent and thorough,

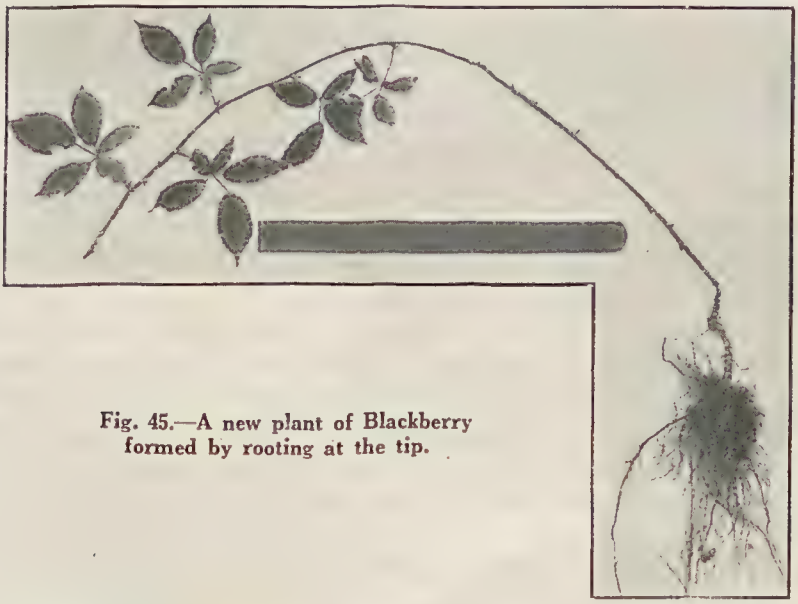


Fig. 45.—A new plant of Blackberry formed by rooting at the tip.

the chief aim being to prevent leaf formation, and thus starving the roots.

The great difficulty with blackberry control is when this plant is growing on land of a rocky or stony nature or on creek or river frontages, or in situations that make cultivation either impracticable or undesirable on account of the danger of soil erosion during floods. In such places, cutting to prevent fruiting will control the plant without eradicating it, usually two cuttings a year being sufficient to stop its further spread.

This is unsatisfactory, because the work has to be repeated year after year; it is cheaper to kill the roots and have done with them, and for this purpose chemicals could be employed. If an arsenical preparation is used, the brambles should first be cut and burnt as already described, otherwise, if the bushes are sprayed with arsenic

without previous cutting and burning, the leaves drop off, leaving a jungle of loose canes that make their removal difficult afterwards, either by fire or by cutting.

If a clean burn has been obtained, the shoots that will afterwards spring up can be easily destroyed by the arsenical spray every time they make their appearance. There are at the present time on the market some excellent preparations of arsenic of great solubility, that should do away with the necessity for using the home-made preparations, but for those preferring to prepare their own arsenical sprays. the following mixture can be recommended as having given good results against blackberries:—

Boil together 1 lb. white arsenic, 2 lbs. washing soda, and 2 gallons water. When dissolving use a slow fire, only allowing the mixture to simmer; if the solution is boiled rapidly, there is a risk of the material

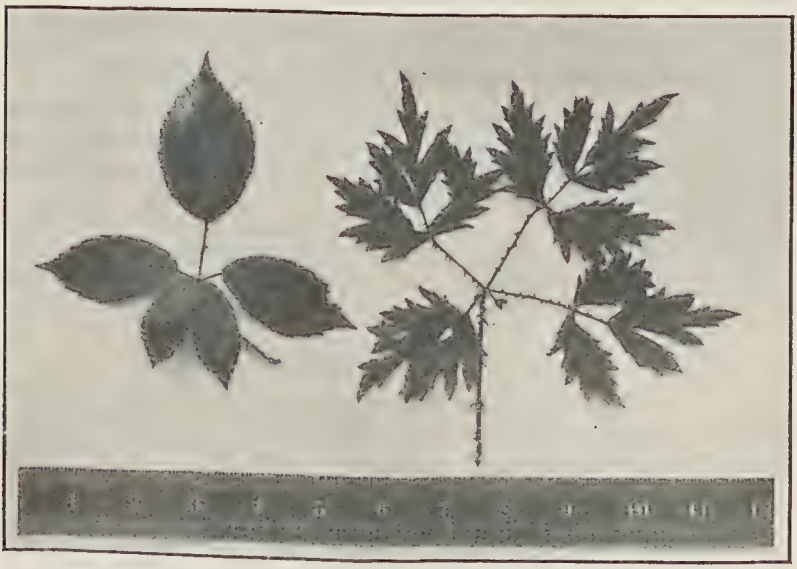


Fig. 46. Leaf of Common Blackberry and of Cut-leaved Blackberry.

boiling over. The liquid should become clear in about 30 minutes; then make it up to 10 gallons.

It is not advisable to make a concentrated stock of dissolved arsenic, as in all probability it will crystallize on becoming cold necessitating it all being boiled over again

In spraying with arsenical mixtures, one should stand with his back to the wind, so that the material will be carried away from the operator.

As arsenical preparations are exceedingly poisonous, stock should always be removed from land being treated with this chemical.

When large masses of blackberries are growing on banks of watercourses (one of the plant's favourite places), it is not always advisable to use arsenical preparations. In such situations, as many of the canes as can be reached should be sprayed with crude petroleum during the summer months, and then the outside masses should be slashed down and the lot burnt. Shoots arising later could be again

sprayed with this oil, or salt might be liberally applied to the crowns of plants during hot dry weather.

The application of caustic soda has been recommended against blackberries, 1 lb. caustic soda being used to 2 gallons water and applied by means of a watering-can, further applications to be made when new growths appear.

A small mob of goats can be most effectually employed against blackberries. Their smooth hair allows them to poke about among the brambles in search of the leaves without any danger of becoming entangled, as sheep would under similar conditions, and if all the leaves are kept eaten off the plants will soon be completely killed. The results would be much quicker if the top hamper of brambles were first removed by means of fire, and the goats then allowed to deal with the young shoots when these made an appearance.

Some very large patches of blackberry bushes have been completely destroyed by a small mob of goats in the north-east of Victoria.

The Cut-leaved Blackberry, *Rubus laciniatus*, Willd.

This bramble, which often goes by the name of Italian blackberry, though its country of origin appears to be uncertain, is becoming very widely spread. It has already a very bad reputation, and should be destroyed wherever it is possible to do so.

The same methods of eradication recommended for the common blackberry should be used against this species. Fig. 46 shows leaves of both species of blackberries; that on the left is the common blackberry, while that on the right is the cut-leaved blackberry.

(To be continued.)

MINERALS FOR PIGS.

If a pig be left to its own devices, and given a certain amount of liberty and access to a variety of feed, it will balance its own ration. No domestic animal possesses the instinct of knowing what its system requires better than the pig, and the same claim can be made respecting the craving for mineral matter, which is not so manifest in any other farm animals. Should the requisite amount of mineral substance needed for the normal growth of the animal be not supplied in its feed, the pig will, if given range enough, find in the earth that which it needs. Any one who has had anything to do with pigs must have noticed this strong desire for mineral substances, particularly in the case of growing animals and breeding sows. Mineral in the natural state as is found in the ground or in the form of inorganic salts in burnt wood, bones and vegetation, is essential to a pig, and is utilized not only for the formation of a skeleton but in the case of brood sows is necessary for the development of the unborn young. Indeed, a certain amount of mineral matter during pregnancy is essential for health and strong litters. This fact should never be lost sight of by breeders.—*Industrial and Mining Standard*, 22.6.22.

CASSE.

Wine Defects not directly caused by Micro-Organisms.

(Continued from page 431.)

By F. de Castella, Government Viticulturist.

Blue, Black, or Ferric Casse.*

Blue casse differs radically from the brown form in its nature, in its symptoms, and in its treatment.

The only points in common are that both occur on exposure to air, and that neither is caused by bacteria.

Blue casse is merely due to an excess of iron in the wine. All wines contain iron, but in very small quantity, the normal content being in the neighbourhood of 1 centigramme per litre (1 part per 100,000).† When this proportion is exceeded, trouble is likely to occur on exposure of the wine to air. The iron present in the wine is combined with its different acids in the form of tartrates, malates, citrates, tannates, &c. There are two series of salts of iron, viz., ferrous and ferric, the former containing less oxygen than the latter. On exposure to air, the ferrous salts are oxydized to the ferric form, which, acting on the tannin, form ferric tannate, or ink, hence the blue or black colour.

The exact state in which these substances are present is far from simple. A complex balance seems to establish itself between the iron combined with the acids of the wine and that capable of forming tannates. On this balance being disturbed the blue colour may appear. Hence the occasionally disappointing results of tannin addition, which sometimes makes condition worse instead of improving it.

Blue casse is most noticeable in white wine, though it may also occur in red, in which case, being masked by the colour of the wine, it may be mistaken for the brown form. In red wine the case is more complicated, as will be shown presently: The simpler case of white wine, with its more typical and striking manifestations can appropriately be considered first. The wine remains clear until exposed to air; after a racking, which aerates it, it becomes cloudy, first taking on a dull leaden colour, which may even be bluish-black, as though a few drops of ink had been added. The cloud ultimately settles in the lees, but sometimes it takes a long time to do so. After settlement, the lees are found on analysis to be rich in iron, whilst the wine contains less iron and tannin than previously. Most of us are only too familiar with white wines in bottles, which, though bright and of attractive colour before the cork is drawn, become dull and leaden looking a day, or even a few hours, after being decanted. This is perhaps the best known and most annoying form.

How does Iron get into Wine?

In the special case of Jacquez the high iron content is peculiar to the grape. In other wines iron is more often introduced accidentally.

* Some writers use the term "black," especially when white wines are affected, reserving the term "blue" for changes of the same nature in red wine.

† See Appendix, page

Our forefathers were wise in avoiding the use of metals in their cellars, and only allowing grapes or wine to come in contact with wooden vessels and implements, and bare hands and feet.

In our wineries iron is everywhere. Presses, stemmers, coolers, &c., are mainly made of iron. It is true that this becomes more or less protected by the formation of a black coating; but I think we would be wise in substituting bronze or gun-metal for iron wherever possible. One centigramme per litre added to the iron content of a normal wine is sufficient to cause trouble—in other words, 42 grains per hogshead. A 3-in. wire nail weighs over 80 grains (82½, to be accurate). The ubiquitous kerosene tin, into which our grapes are usually picked, is no doubt responsible for much iron in the wine. Rust is more easily dissolved than metallic iron. It would be well to paint tins inside with some non-poisonous paint, or even well-boiled coal-tar. The kerosene tin, unless new and bright, is a poor cellar utensil.

Though very undesirable in a wine, iron is not unwholesome. In this it differs from zinc, which is a poison. Galvanized iron receptacles, &c., should be absolutely banished from the cellar, since the zinc coating is rapidly attacked by wine. Lead is even worse. Brass, so often used for taps, &c., being an alloy of zinc and copper, is much attacked and therefore undesirable. Bronze or gunmetal (tin and copper) and block tin are the safest metals for cellar use. Copper is not attacked so long as the red metal surface is clean and bright. The dull coat of oxide which soon forms is, however, rapidly attacked.

Our soils contain much iron, usually over 3 per cent. A little mud or earth crushed with the grapes may easily double the normal content of 1 centigramme per litre.

Cement vats are also a source of iron, since cement contains much of this metal. Unless cement vats are carefully paraffined, wine fermented or stored in them may easily dissolve iron in undesirable quantity.

Mathieu* recommends painting all ironwork with which grapes or must come in contact with a varnish, consisting simply of shellac dissolved in alcohol, easily applied with a brush. "It dries rapidly, forming a hard coating which is very adherent if the surface to be painted was well cleaned, the metal being laid bare and free from rust." After vintage the few spots where the varnish has worn off can easily be re-coated. Such patches must first be thoroughly washed and quite dry. "Every cellar where iron machinery is in use should have its pot of shellac varnish, as indispensible as a shifting spanner."

Blue Casse of Red Wine.

Aeration precipitates ferric tannate in a red wine containing much iron, just as it does in a white wine, but the blue tint is less noticeable, being masked by the colour of the wine. Red wines are, as a matter of fact, even more liable than white, owing to their much higher tannin content. The problem is further complicated by the fact that red wine contains two different tannins, viz., œnotannin, as in white wine, though in larger proportions, and the red coloring matter, which is itself a tannoid or tannin-like substance.

The earlier investigations of blue casse were, indeed, in connexion with a red wine—that made from Jacquez,† which is full-bodied and

* *R. Vit.*, LV., 231, 29 Sept., 1921.

† Jacquez (called Lenoir in U.S.A.), a direct producer, at one time largely grown in France, where it was also used as a stock. It is still so used at the Cape, mainly for Gardo Blanco.

poor in acid, but of intense though unstable colour. Its well-known predisposition to casse (blue) is due to this peculiarity, and also to its being rich in iron. In order to make Jacquez wine of stable colour, it was found necessary to increase the acidity (tartaric) to 12‰, whereas 10‰ suffices for the Bouschet Hybrids and 8‰ for ordinary South of France varieties, such as Aramon, Carignane, &c.*

So long ago as 1887 Bouffard published a monograph on the making of wine from Jacquez in which he described the mechanism of blue casse, which also affects many other wines. He showed how air is necessary to cause the wine to turn blue; that the blue sediment, insoluble in water, is soluble in tartaric acid; that on calcination this sediment leaves 10% of its weight of iron sesquioxyde, which, transformed into a ferric salt and added to wine, causes an intense blue precipitate. He concluded, "that there exists in the wine a ferrous œnolate,† which on oxydation by air, passes to the state of blue ferric œnolate and is precipitated.

In a later article on casse,‡ Bouffard attributes blue casse to the formation of a compound of colouring matter (acide œnolique) and iron oxide. He recalls how A. Gautier long since pointed out the existence of a blue black ferric œnolate, also the fact, known to cellarmen, that wine, left for a time in an iron vessel, throws, on exposure to air, a bluish sediment.

He further pointed out the uselessness of pasteurization for blue casse, and how, in view of the striking difference between the brown and the blue forms, there was no excuse for the confusion at that time very prevalent between the two. He recalls how, in 1887, in connexion with Jacquez wine, he had recommended copious aeration, to provoke sedimentation of oxidisible matter as the first stage of treatment. In his later article he gives preference to citric acid treatment and looks upon excessive aeration as somewhat dangerous and prejudical to bouquet owing to its "flattening" effect.

Though we do not grow Jacquez, blue casse of red wine presents, in the writer's opinion, considerable interest in Australia. It is highly probable that much of the condition trouble of our fuller bodied red wines is due to this cause; many of these wines, like that made from Jacquez, are dark in colour and poor in acid. If, in addition, they should contain an excess of iron, either naturally or accidentally, the blue precipitate will surely form on exposure to air. The somewhat lighter colour and body, often noted in Australian wines bottled in London, as compared with the type of wine shipped from Australia, is no doubt mainly due to the elimination of much colouring matter and tannin, &c., which are rendered insoluble during the shaking the wine receives on shipboard. The powerful ageing effect of a sea voyage on wine has long been known.

Laborde, in an exhaustive article on the tannoid matters of wine, refers at some length to blue casse of red wine. The following extracts are of interest:—

With red wines the slight colour changes, resulting in a bluish and dull appearance, followed by a more or less marked lack of clearness, are known as *blue casse*. It was first remarked in the wine of a special vine variety, viz., Jacquez.

In contact with air the normal colour becomes more and more violet and dull; if the surface remains quite still an extremely thin irridescent film may be observed: a blue black precipitate then forms and settles down, but the quantity of tannoid substances which become insoluble is never very considerable even if aeration be somewhat exaggerated. Similar changes are not rare for other varieties; they are more frequent in wine yielded by young vines, and in certain seasons or soils.

* Roos' "Wine Making in Hot Climates," pp. 54 and 221, translated by Dubois and Wilkinson.
† *R. Vit.*, XV., 37 ; &c., 6th April, 1901.
‡ Oenolic Acid is a term at one time freely used to designate the tannin of wine.

Spontaneous return to limpidity follows complete sedimentation of the precipitate after a variable time, according to the intensity of aeration and the nature of the wine. If aeration was sufficient the colour of the wine has then lost its earlier sensitiveness. . . . .

The richness of the wine in iron seems to be connected with the colour change; this is confirmed by the action of citric acid, which is, *for equality of weight, twice as active as tartaric for prevention of blue casse,* and which, therefore constitutes a chemical antidote against the precipitation of iron. The addition of tartaric, or, better still, citric acid keeps the iron sesquioxyde in solution, thus preventing its combination, in insoluble form, with tannoid substances. Blue casse would thus have for cause, an unstable equilibrium between the acidity of the wine and its iron content, the first being too low in proportion to the second.

The question is much less simple than would appear at first sight; wines occasionally behaving in quite unexpected ways. Laborde quotes cases where precipitation occurred on exposure to air, though the iron content was but little above normal (1.5 to 1.8 cgms.). In most cases tannoids were precipitated in much greater proportion than iron. He concludes, "That the precipitate is not a definite compound of iron and tannin . . . . but a complex mixture, containing, in addition to tannoids and iron, nitrogenous organic matters and mineral substances such as phosphoric acid, lime, &c., thrown down owing to the colloid nature of the precipitate, the basis of which is colouring matter and œnotannin."

He attaches considerable importance to the loose combination which seems to exist between potash and tannoids, especially colouring matter, and recalls Martinand's *Potassic Casse,* referred to below and which is probably more common in Australian wines than is realized. He mentions two wines of Claret type, similar in composition, except that one contained more œnotannin than colour, whilst the other, on the contrary, contained more colour than œnotannin. The first was stable on aeration, the second was liable to casse. However, after moderate aeration followed by fining and the addition of 50 cgms. of citric acid, it was completely cured and had lost half its original iron contents.

It is thus evident that definite values cannot be assigned to the parts played by iron and tannoids, and that it is exceedingly difficult to fix an iron limit beyond which casse must be reckoned with. The air test gives the most reliable information, and is of very simple application.

TREATMENT OF BLUE CASSE.

Whether in white or red wine the treatment is the same; it differs radically from that of brown or oxydasic casse, the precipitate of ferric tannate being promoted by active aeration.

Pasteurization is quite useless, since it has no effect on the iron contained in the wine, at least, no permanent effect. It is true that the cloud resulting from exposure to air, redissolves on heating, but only temporarily, it appears again after cooling. A wine pasteurized at 100° C. (boiling point) is just as liable to cloud as it was before treatment. Nor is the addition of SO_2 satisfactory. It certainly prevents the formation of ferric tannate, owing to its avidity for oxygen, but the protection is only temporary. When the SO_2 is oxidized or combined, the liability to blue casse returns.

Ferric tannate is soluble in tartaric and citric acids, and in the case of wine which is only slightly dull, the addition of a small quantity (½ to 1 gramme per litre) of either acid will effect a marked improvement. We have seen how increasing the acidity was recommended so long ago as 1846. It should be remembered that, owing to complex reactions, the addition of tartaric acid to a wine only increases the total acidity by about two-thirds of the quantity added. With citric acid the increase is equal to the added acid. See p. (489). Citric acid is

usually considered more effective than tartaric; twice as effective according to Laborde, whilst other writers go even further.

Addition of acid, however, merely redissolves the cloud, it does not remove any of the iron. A much more logical treatment is aeration, which causes part, at least, of the iron to be thrown out of solution. If the wine be poor in tannin, a little should be added, say, half an ounce to an ounce per 100 gallons, and the wine energetically aerated. A bicycle pump connected with a ¼-in. copper tube closed at the end and drilled with a few very small holes will be found most convenient. Ferric tannate will be formed, putting the wine into shocking condition; but this is only temporary. The precipitate will eventually fall into the lees, leaving the wine bright and reduced in iron content. It must be remembered that aeration is severe on some wines, especially on light delicate ones, unduly ageing them and reducing bouquet. Wines can, therefore, be best treated in this way when quite young. After aeration, the wine should be fined or filtered, and when bright the addition of 2 or 3 oz. of tartaric or 1½ to 2 oz. of citric acid per 100 gallons will prevent a return of the trouble.

In order to ascertain whether or not the wine is liable to blue casse, the air test is applied, just as was described previously, the simple test with a half-filled glass covered with a card being usually sufficient. Care must be taken that the wine does not contain too much of either carbonic or sulphurous acid, which would protect the ferrous tannate from air, and prevent the formation of a cloud, thus rendering the test misleading. Aeration with a bicycle pump for a few minutes will drive off these acids.

An ingenious method of what might be termed super-aeration, recently recommended in France,* consists in forcing gaseous oxygen from an ordinary steel cylinder, delivered through a reducing valve at a pressure of 4 kilos (57 lbs. per square inch) into the porous porcelain candle of a chamberlain filter submerged in the wine. The gas escaping in very minute bubbles forms what almost amounts to an emulsion, thus giving intimate contact and rapid and active oxygenation.

Ferrous salts are thus oxidized and pass to the ferric state. Insoluble ferric tannates are formed and precipitated together with coagulated albumen and gelatine. These last remain in solution when the iron is in ferrous form; in the language of cellarmen "the wine will not take the finings." After oxidation, striking results are recorded, a wine containing 16 cgms. iron turned inky black—fined four days later with gelatine, greyish flakes formed, easily removed by filtration, leaving the wine bright. On analysis it was found to have lost three-quarters of its original iron content.

Similar treatment of red wines liable to blue casse resulted in a like decrease in iron content. After filtration these wines were brilliant, of a fine ruby colour and perfectly stable.

In a later communication,† the same authors describe similar experiments with musts, in connexion with the making of white wine from red grapes—the active oxygenation destroyed most of the colour which it was desired to eliminate. They quote Zenghelis (C.R. Vol. 170, 1920, p. 883), who showed that gases, finely divided by passage through a

* Piedallu, Malvezin, and Grandchamp. Communication to the Academie des Sciences, 10th May, 1920.

† January, 1921.

porous membrane, act as though in nascent form, their action being thus considerably increased. . . . . Oxygenation can also be obtained by the addition of hydrogen peroxyde, but its effect on the wine is too drastic and brutal; it is also prohibited by French pure wine laws. It was these facts which led to the trial of oxygen in fine bubbles, as described above. It is to be regretted that the quantity of oxygen used is not stated; it does not, however, appear to be considerable.

The filter candle could probably be used with advantage in ordinary aeration, of which it should greatly enhance the efficacy. It should be remembered that air contains one-fifth of its bulk of pure oxygen.

Obviously the smaller the bubbles the greater the surface of contact. Forcing air under pressure through a few small apertures will aerate much more effectually than the large bubbles from a cellar pump working empty. The minute bubbles from the filter candle will, of course, be still more effectual, whether the oxygenating agent be air or pure oxygen.

Pacottet* describes a wine trouble sometimes occurring in very cold weather which might be mistaken for blue casse. It is due to a cloud so fine as to be almost invisible, yet sufficient to split up light, only permitting the passage of blue rays. It may be so fine as to be unaffected by fining or filtration, and to settle very slowly. Such a cloud may be artificially produced by adding to a wine mere traces of gelatine and tannin.

How to Distinguish Between Brown and Blue Casse.

Seeing that the treatments for these two forms differ so widely, and that in certain cases it is not so easy as might be thought to distinguish between them, the following hints may be of use.

Take a clear glass bottle, half-filled with the wine, shake and plug with cotton wool. If no cloud forms after a couple of days, the wine is not liable to any form of casse. Should a cloud appear, add a crystal of citric acid the size of a pea; shake until dissolved. If after a few hours the wine again becomes bright, it indicates blue casse.

Take another sample of the wine which clouds on exposure to air and fill a strong pint bottle with it; tie the cork securely and heat to boiling in a water bath. When cold, draw the cork; half-fill a clear glass bottle with the heated wine and plug with cotton wool as before. Should this wine become cloudy after a day or two, it is a case of blue casse; if it remains bright, of brown casse.

White Casse.

This is characterized by a milky white cloud which occurs, as in other forms of casse, on exposure to air. It is most frequent in white wine, especially in those containing much free tartaric acid; red wines may also be affected, but they are much less liable, and the characteristic white cloud is masked by the colour of the wine. White wines thus affected are troublesome to handle, the cloud being light and slow in settling. Notwithstanding the marked difference in the outward appearance this form is closely related to blue casse, since it results from the presence of an excessive proportion of iron in the wine. In this case, however, the surplus iron is combined with phosphoric acid and not with tannin as in blue casse. In addition to iron and phosphoric

* *Vinification*, p. 264.

acid, lime seems to play an important part. Pacottet connects white casse with the use of cement vats, the surface of which is insufficiently protected from attack by the wine. The standard treatment consists in the addition of citric acid; tartaric acid is of little or no use.

White casse was first mentioned by Bouffard in 1901, in an article on different forms of casse. He pointed out that a new form should be added to the list, viz., white casse of more obscure origin than the other forms, but which yields to the specific action of citric acid.

The milky opalescent cloud and whitish sediment are the consequence of oxidation by air, in spite of pasteurization, sulphurous acid, and even tartaric acid. The colour of the wine does not seem to play a part. The sediment, consisting of oxidized substances, seems to contain lime, perhaps iron. Citric acid alone prevents its production.

With intuition similar to that shown in connexion with brown casse, Bouffard again indicated the cure before the nature of white casse was understood. It is to Laborde,* however, that we owe the complete explanation of the disorder.

In addition to blue casse, air often provokes, in white wine, a milky cloud, as a rule very slow in settling, and which constitutes Bouffard's white casse. . . . Sulphurous acid is without action, tartaric acid almost equally so; citric acid alone attenuates the effects of aeration, thus indicating that, as in blue casse, iron is not foreign to the phenomenon. . . . Iron is not, however, the most important constituent of the very complex precipitate. . . . Organic substances usually predominate, besides some phosphoric acid and lime.

Experiments are described with artificial liquids of similar composition to wine, in which the proportion of any constituent could be varied at will. In such, the addition of iron, in ferrous form (4 or 5 cgms. of sulphate), followed by aeration, caused a cloud identical with that of white casse, even in the absence of tannin, thus proving its formation to be independent of this substance.

He further describes how an aqueous solution of phosphoric acid (1 gramme per litre) to which 4 or 5 grammes of cream of tartar are added, remains limpid. Nor does the introduction of a ferrous salt bring about any immediate change. On aeration, however, it soon becomes opalescent, and ultimately a cloud forms. These changes can be immediately brought about by adding hydrogen peroxyde or by substituting a ferric for the ferrous salt.

He thus sums up the changes responsible for white casse in wine:—"On contact with air the iron contained by the wine in the form of ferrous salts passes to the ferric state. Peroxyde of iron forms with the phosphoric acid, that is a mineral constituent of wine, an insoluble iron phosphate which is precipitated, carrying down with it tannin, proteic and mucilaginous substances, lime, &c.

The cloud of white casse can be induced in many stable white wines by adding a small quantity of a ferrous salt. . . . These reactions depend also on a state of equilibrium variable according to the composition of the medium. It has been shown that the accidental introduction of iron can also bring about black casse; we have thus a case of the same cause producing different effects in consequence of differences in the constitution of the medium.

On studying these differences one finds that black (blue) casse occurs in wine containing little or no free tartaric acid, and white casse under contrary conditions. In the first case the greenish-black ferric tannate can form at the same time as the colourless phosphate, whereas in the second the free tartaric acid prevents the existence of tannate without interfering with the precipitation of ferric phosphate. He goes on to show that white casse is more frequent in vintages when the grapes do not ripen properly, and that the use of new cement vats, or any other cause unduly increasing the iron content of the wine, renders wine liable to white casse.

White casse may occur in red wine, in which case its character is altered, owing to the colouring matter of the wine, part of which is

* J. Laborde, "Etude Sur Les Matières Tannoïdes Du Vin," *R. Vit.*, numerous articles from August, 1908, to March, 1910.

deposited with the ferric phosphate. In Laborde's opinion, red wines are much less liable than white, since they are seldom rich in free tartaric acid.

In this case it would still be a blue casse, because the precipitate of ferric phosphate would carry colouring matter down with it. As a rule, the blue-black sediment of red wines, liable to blue casse, only contains traces of phosphoric acid.

In a communication to the Academie des Sciences on 5th March, 1917, Laborde resumes his earlier experiments, and adds the result of more recent observation to the effect that "SO_2, like tartaric acid, converts black casse into white casse; this last can occur even in presence of free sulphurous acid. Furthermore, citric acid, used even preventively at the legal dose of 50 cgms., does not always entirely prevent the effects of aeration, but it generally favours the coagulation of the whitish cloud.

Thus, the rational treatment of white casse in wine containing free SO_2, would consist in first bringing about the cloud by aerating sufficiently, adding citric acid, and finally clarifying, after a few weeks' rest, by fining or filtration.

It will be noted that this treatment is practically the same as that of blue casse.

Fouzes Diacon, of Montpellier, has also investigated white casse, the conclusions he arrives at are in accord with those of Laborde. The following are extracts from a communication to the Academie des Sciences* :—

The whitish sediment, which is greyish-white after drying, contains organic matter and mineral elements; lime is present in very small quantity, the proportion of iron is more considerable, it is combined with phosphoric acid as basic ferric phosphate $(P_2O_5)2Fe_2O_3$, soluble in citric acid, as has been pointed out by Moissan.

Fouzes Diacon differs somewhat from Laborde concerning the action of SO_2, holding that it is only after its oxidation that the cloud forms on aeration. The medium being no longer a reducing one, the air acts on the ferrous compound present in the wine, precipitating it in the shape of basic ferric phosphate combined with lime and organic matter. Lime is indispensable. . . . if this be eliminated the wine no longer clouds on aeration; but the proportion of lime naturally present in white wines is always sufficient for it to occur. Excess of iron and phosphoric acid are equally indispensable; this form of casse can be caused in a sound white wine by the addition of small quantities of ferrous sulphate and ammonium phosphate followed by oxidation, by passing air through it or by hydrogen peroxyde.

He sees one of the chief causes of this disorder in the extensive use in Southern France of sulphurous solutions of ammonium phosphate. The white wines in which it most frequently occurs are much exposed to contact with iron in their treatment in the winery.

White casse, though interesting, is probably much less frequent in Australian wines than the blue form, owing to their low acidity, as compared with French wines. In the cooler districts, however, especially in seasons when the grapes do not ripen thoroughly, it may have to be reckoned with.

Citric Acid.

The use of this acid has been referred to several times in the foregoing pages. A few remarks concerning the legality of its addition to wine and the doses in which it may be employed will, therefore, not be out of place.

The pure wine laws of Victoria and the other States of the Commonwealth do not specifically mention citric acid; its use is, nevertheless, legal in Victoria, since the Health Act of 6th January, 1920, sec. 218(*b*)

* *C. R.*, 22nd January, 1917.

(IV.), includes among the permitted additions "natural products of grape vine leaves or flowers." Citric acid is a normal constituent of vine leaves.

Most European wine laws permit the use of this acid. In France, prior to 1908, it was not definitely permitted. Though not listed as a prohibited substance, in view of the severity of French pure wine legislation, its addition was attended with some risk. Nevertheless, its value as a substitute for tartaric acid to increase deficient acidity and its greater potency in improving the "condition" of certain wines had long been recognised. Early in 1908 its use was definitely authorized in proportion not exceeding 50 centigrammes per litre (8 oz. av. per 100 gallons).*

Prior to this the risk, or perhaps, more correctly, the doubt as to the legality of its use, was the cause of considerable inconvenience, more particularly to the sparkling wine industry, which had long since found the addition of small quantities of citric acid to be quite indispensable for the avoidance of some of the condition troubles described above.

This legalization of citric acid was a great boon to cellar managers; from a health stand-point no exception can be taken to its use, since it is quite as wholesome as tartaric acid; furthermore, it is not foreign to the grape, but a normal constituent, though usually present in small proportion, it may in certain cases be fairly plentiful.

The existence of citric acid in the grape has long been admitted, but it was usually thought to be only occasionally present and in minute quantity. More recent investigations show that it exists in most grapes in larger quantities than was formerly thought. Dupont† in 1908 examined a collection of southern French wines of vin ordinaire type; he found the citric acid content to be, as a rule, not less than 10 cgms., whilst in some cases it was as high as 50 cgms., sulphited wines usually containing a higher proportion than those not so treated, owing to protection from acid-consuming organisms during fermentation.

The question was further investigated, at the request of the Bordeaux Chamber of Commerce, by Blarez, Denigès, and Gayon in 1914. The wines examined were mainly from the Sauternes district, but samples were included from Montbazillac, Anjou, and the Rhine. Most of these contained citric acid in quantities varying from 5 to 30 cgms.; a sauternes of 1906 vintage contained no less than 45 cgms.

Fresh grapes (from Sauternes) were also examined; the citric content varied from 10 cgms. for sound grapes to 65 cgms. in the case of grapes much affected by *Botrytis cinerea* (noble rot).

Citric acid has a characteristic sharp taste, the taste of lemon juice in fact, which is noticeable if added to the wine in any quantity. For this reason the fixing of a legal limit seems scarcely necessary. Considerably less than the 50 cgms. allowed in France gives most wines an excessive and disagreeable acidity.

The molecular weight of citric acid (67) being lower than that of tartaric (75), a smaller quantity is necessary to effect a given increase in acidity. In other words, 67 lbs. of citric will go as far as 75 of tartaric.

Apart from this difference in molecular weights, however, the two acids behave very differently when added to wine. Owing to complex reactions, resulting chiefly in the decomposition of bi-malates and the

* See circular of M. Roux, Chief of the Service for the Repression of Fraud, of 13th May, 1908, issued on the advice of the Commercial Commission and of the Permanent Technical Commission of the French Customs. This circular sets forth that the addition to wine of pure citric acid, in proportion not exceeding 50 grammes per hectolitre (50 cgms.), is not to be considered contrary to Art. 2 of the Decree of 1907.

† *R. Vit.*, XXX., pp. 173 and 203.

precipitation of part of the added acid as cream of tartar, tartaric acid only increases the total acidity, by a portion of the acid which is added. The exact increase varies somewhat according to circumstances, but is usually admitted to be about 70% of the added acid for quantities up to 4 grms. per litre (4‰).

Citric acid, on the other hand, causes no saline precipitate to form—the increase in acidity is equal to the weight of added acid, after making allowance for the difference in atomic weights already referred to.

The two acids vary again very considerably as regards the efficacy of their action on blue casse, citric acid being much more powerful in this direction. As to how much more so, authorities differ. Laborde holds citric acid to be twice as effectual as tartaric. Gouin* goes much further, considering it to be ten times as active.

Though a most valuable help to the cellarman, more particularly in certain troubles described above, citric acid must be used with discretion, and at the minimum dose necessary to attain the desired result. It must be remembered that Australian wines are in demand by customers who usually dislike wines of high acidity. Such small additions as an ounce to the 100 gallons (one-eighth the French legal limit) often effect marked improvement in the condition of a troublesome wine.

Appendix.

TABLE SHOWING THE CORRESPONDENCE OF SOME METRIC AND ENGLISH WEIGHTS AND MEASURES.

In the foregoing pages, quantities of SO_2 have been expressed in centigrammes per litre, this being the most concise and convenient way. In order to permit rapid conversion to English standards, the following table has been compiled.

It may first be explained that centigrammes per litre are identical with parts per 100,000. They are likewise identical with grammes per hectolitre.

Centigrammes per litre = parts per 100,000.	Grains per gallon.	Ounces (avoirdupois) per 100 gallons.
1	·7	·16
2	1·4	·32
3	2·1	·48
4	2·8	·64
5	3.5	·8
6	4·2	·96
7	4·9	1·12
8	5·6	1·28
9	6·3	1·44
10	7·0	1·6

It should be remembered that fresh bisulphite of potash contains practically half its weight of SO_2. It follows that 5 centigrammes per litre of SO_2 are equivalent to .8 oz. of SO_2 per 100 gallons, or to 1.6 oz. of bisulphite of potash per 100 gallons.

Bisulphite soon loses SO_2 on keeping—after some months' storage the loss may be considerable, especially if it be not kept in air-tight tins or bottles.

(To be concluded.)

TWO NEW VARIETIES OF BLIGHT-PROOF APPLE.

By C. F. Cole, Orchard Supervisor.

A long-standing menace to the apple-grower, and one that has greatly increased the cost of production is the too well-known and widely distributed disease "Woolly Aphis" (*Eriosema lanigera*). Therefore, the raising of a variety of good flavour, form and colour, and keeping qualities, and one which in addition will remain immune from the disease must be of interest to all fruit-growers. This claim can be made for two varieties raised in recent times which have been named "Cole" and "Boswell."

The original seedling trees, although growing under similar climatic conditions, and alongside trees very prone to attacks from "Woolly Aphis," remained free from this pest. To test their immunity, scions were grafted upon stubs badly attacked by this disease, and the growths from the scions were tied to adjoining lateral growths from the stubs covered by "Woolly Aphis." Twelve months later the result was negative. During a later test a graft of the "Cole" variety became slightly attacked, but eventually cast off the disease.

In view of these severe tests, and the fact that the original seedlings remained immune, there is no doubt that these two varieties may be classed as "blight-proof." Another important factor found in connexion with both varieties is that if the flesh of the fruit is bruised, the injured portion becomes dry and corky, soft rot not developing. Apples so treated were tested under the cool and ordinary storage conditions.

During storage tests neither variety showed signs of "Bitter Pit" or superficial pitting, and so far both have proved good and long storers. The "Cole" variety has kept under ordinary storage conditions with safety until September. Though both these varieties originated in districts where ideal conditions exist for the development of the "Black Spot" (*Venturia inequalis*), they have proved so far to be unsusceptible to severe attacks and the "Cole" variety has shown a certain immunity against this fungus pest.

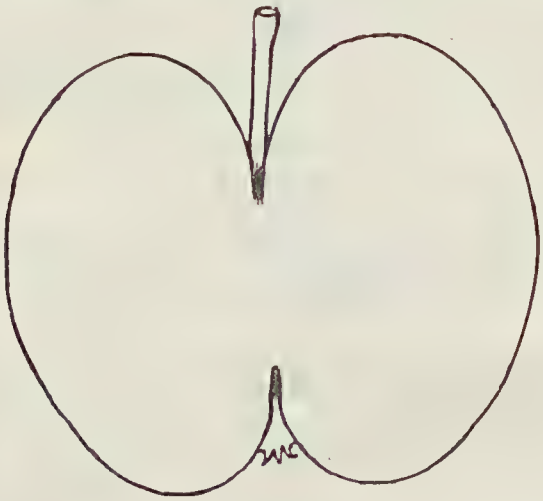
Boswell.

This was a chance seedling, which grew from a pip in the orchard of Mr. H. Boswell, at Stanley, Victoria. It is supposed to be a cross between the Winter Majetin and the Jonathan. The fruit gathered from the original seedling tree was submitted to the Committee of the Australian Pomological Society. The members reported that it was a beautiful apple. I first suggested the name "Boswell's Pride"; later owing to likely confusion the word "Pride" was dropped from the same, and it is now known as Boswell.

There is no doubt that when this apple becomes more widely known it will, owing to its great resemblance and freedom from "Woolly Aphis," be largely planted, and become a rival of Jonathan, and in many districts take the place of this highly commercial variety.

The tree is more productive, stronger, and more upright grower than the Jonathan; the wood is reddish in colour, and lightly speckled with greyish dots; the buds are full and prominent; the foliage in similar in shape, but slightly larger. The tree is an early bearer, producing its fruit upon spurs and lateral growths. The flowers are bold, the petals being full like the winter Majetin variety; the period of blossoming, partial and complete, is 15th to 23rd October.

The fruit is a handsome desert type of medium size; the shape may be roughly described as roundish conical, or tapering to the eye; the skin is smooth and thin, ground pale yellow, lightly splashed with lively red narrow broken stripes. The whole of the exposed surface is covered with lively red, deepening into a brilliant or dark red where exposed to the sun, faintly speckled with small light yellowish dots. The stalk, averaging three-quarters of an inch in length, is rather slender and inserted in a deep regular cavity. The flesh is white, sweet, tender,



Boswell.

juicy; the core is compact, the calyx is small, closed, the segments pointed, re-curved and set in a fairly broad deepish corrugated basin. Its season may be set down as from early March to June. If highly coloured it may be gathered early for export, and in cool storage it will remain in good condition until the end of November.

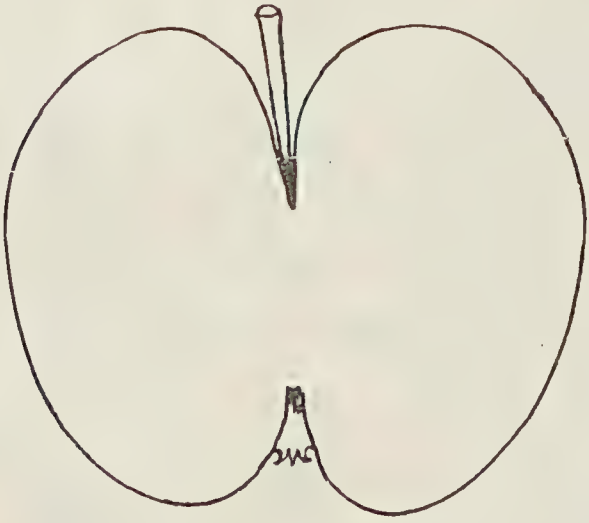
Cole.

This was another chance seedling; it is supposed to be a cross between "Jonathan" and "Dutch Mignone" varieties. The original seedling is still standing upon the property of Mr. R. G. Cole, orchardist, Lang Lang, Victoria, where the pip germinated. The producer first exhibited this apple at the fruit carnival held in the Exhibition buildings, Melbourne, in 1912, and won the silver medal for a Victorian-raised seedling. The seedling was registered with the Royal Horticultural Society of Victoria under the name of "R. G.

Cole's Champion." The writer submitted it under the name of "Cole's Champion" to the committee of the Australian Pomological Society, but owing to likely confusion the word "Champion" has been dropped, and "Cole" accepted as the future name of this apple.

The tree is very productive, and a strong upright grower. The wood is dark, becoming reddish in colour with age and lightly speckled with grey dots; the buds are moderately prominent; the foliage is medium in size, and dark green in colour. During the 1920 fruit season, 22 cases of saleable fruit were gathered from the original seedling tree. The flowers are not bold, and are medium in size. The blossoming period is from the 12th to 20th October.

The apple, which has been tested under cool store conditions, is also a handsome desert type of medium size, roundish conical, or tapering to the eye; the skin is thin and smooth; the ground clear pale yellow, splashed with lively red narrow broken stripes. The whole of the



Cole.

exposed surface is a light red, becoming deeper in colour where reached by the sun. The flesh is firm, white, crisp, juicy, sweet, with a slightly perfumed aromatic flavour; the core is compact, the stalk thin and averaging three-quarters of an inch in length, inserted in a deep, fairly regular cavity. The calyx is small and closed; the segments pointed, slightly re-curved, and set in a deep, rather narrow and corrugated basin. Its season is from April to September. It has been proved to be a very long cool storer, and while stored it emits a strong aroma. It could be gathered in some districts about the middle of March. This variety is being largely planted, and it promises to become one of the best late apples introduced.

Most of the cool store tests with both varieties were carried out at Mr. J. M. Rutland's Private Cool Stores, "Santa Rosa" Orchard, Kiewa, Victoria.

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652).

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Ammonia.	As Blood, Bone, and Flesh.	As Bone and Flesh.	As unspecified.	Total.	Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	As Muriate or Sulphate.		
		%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Nitrogen—Readily Soluble.													
Sulphate of Ammonia	A P P L and Sulphate of Ammonia in diamond	20·59	..	..	..	20·59	..	..	..	..	..	18 0 0	The Ammonia Products Pty. Ltd., Lyons-street, Footscray
Containing Phosphoric Acid—Readily Soluble.													
Superphosphate	Cresco, 18 Super.	..	..	..	..	..	17·00	0·50	1·00	18·50	..	5 10 0	Cresco Fertilizers Ltd., 111 North-terrace, Adelaide, South Australia
" "	Cresco, 22 Super.	..	..	..	..	..	21·00	0·50	1·00	22·50	..	6 12 6	" " "
" "	Cresco, 25 Phosphate	..	..	..	..	..	10·00	1·50	13·50	25·00	..	5 10 0	" " "
Containing Nitrogen and Phosphoric Acid—Moderately Soluble.													
Bone Manure ..	Cockbill's Bone Manure	..	5·50	..	..	5·50	..	4·00	10·00	14·00	..	12 0 0	W. and J. Cockbill, 407 Post Office-place, Melbourne
Animal Fertilizer	Valley	..	6·74	..	..	6·74	..	4·19	5·25	9·44	..	12 0 0	The Goulburn Valley Industries Co. Ltd., Shepparton
Bone and Blood Fertilizer	T.B. & S. in diamond	..	5·27	..	..	5·27	..	3·93	9·64	13·57	..	13 0 0	Thos. Berthwick and Sons (Australasia) Ltd., 84 William-street, Melbourne
Bone Fertilizer..	Echuca ..	..	..	4·25	..	4·25	..	8·25	8·50	16·75	..	9 0 0	William George Boyle, Goulburn-road, Echuca
" "	Lloyd's ..	..	..	3·83	..	3·83	..	4·01	7·50	11·51	..	11 0 0	Edward Lloyd, Whitehorse-road, Box Hill
" "	Eagle Point .. E. T. Hoskins BF in circle	..	..	2·90	..	2·90	..	4·50	13·50	18·00	..	7 15 0	Edward Thomas Hoskins, Eagle Point, Bairnsdale
" "	Castle	..	..	2·00	..	2·00	..	1·50	14·50	16·00	..	10 10 0	H. C. Pannifex, 26A Market-street, Melbourne
Bone and Humus Fertilizer	Excello ..	..	..	3·80	0·20	4·00	..	2·00	8·00	10·00	..	12 0 0	" " "

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Ammonia.	As Blood, Bone, and Flesh.	As Bone and Flesh.	As unspecified.	Total.	Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	As Muriate or Sulphate.		
		%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Nitrogen, Phosphoric Acid, and Potash.													
Mixed Manure ..	Cresco ..	1·50	..	..	..	1·50	9·20	1·50	8·50	19·20	*2·50	8 5 0	Cresco Fertilizers Ltd., 111 North-terrace, Adelaide, South Australia
Containing Phosphoric Acid and Potash.													
Mixed Manure ..	Mixed Victoria Phosphate and Potash Sulphate	..	..	..	..	..	..	4·00	9·50	13·50	†5·00	8 6 0	The Phosphate Co-operative Coy. of Aust. Ltd., 440 Little Collins-street, Melbourne
Containing Potash.													
Sulphate of Potash	Hasell's ..	..	..	..	..	..	..	..	..	..	48·65	30 0 0	Arthur Harry Hasell, 17 Queen-street, Melbourne

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust	Bone B Dust ..	2·50	17·00	49·00	51·0	8 0 0	George Benson, Woodford
,, ...	Nova	3·00	18·00	30·00	70·0	11 0 0	H. C. Pannifex, 26A Market-street, Melbourne

* Potash as muriate.

† Potash as sulphate.

18th May, 1922.

P. RANKIN SCOTT,
Chemist for Agriculture.

A VALUABLE LEGUME.

Bokhara or Sweet Clover (*Melilotus Alba*, Desr.).

By J. W. Audas, F.L.S., F.R.M.S., National Herbarium, Melbourne.

Biennial Sweet Clover, or Bokhara Clover, belongs to the Melilotus family, and may be considered the best of its kind, being only slightly rivalled by its fellow species, yellow Sweet Clover (*Melilotus officinalis*) also a biennial plant, and Indian Sweet Clover or King Island Melilot (*Melilotus parviflora*), an annual species. Its origin is so remote as to have become lost in the dimness of obscurity. In common with lucerne, it is said to have originated in Bokhara (Central Asia), and it was certainly known at a very early period in all the countries abutting on the Mediterranean Sea. Having flourished in Europe for so many centuries uncultivated, it has come to be regarded as a weed; but an analysis of its food value revokes this stigma and proves it to be a fodder of highest value. It was not until cultivated in Europe, and then introduced into America, that the various species were segregated. These show up some very marked differences, but all maintain the distinguishing characteristic of the Melilotus family—a strong, sweet, and uncommon flower perfume—more particularly noticeable when drying —due to the evaporation of an ethereal oil which it possesses known as cumarin. So agreeable is this fragrance, that it was grown among hay in England and Scotland for its sweetness long before the fodder value was known or appreciated; but while this attractive sweetness may have popularized the plant, it is really the source of some disfavour, as the cumarin gives a bitter taste to hay which causes cattle to reject it. This bitterness, however, is said to disappear when the clover dries, because then the ethereal oils evaporate, while some of the fragrance remains. Stock will not usually eat Sweet Clover in the green state, but when dry, they will always eat it with avidity.

Yellow Sweet Clover (*Melilotus officinalis*) makes the best hay, as its stems are longer and finer than those of Sweet Clover, and it bears a bigger proportion of leaves and flowers. It is of erect growth, and reaches about 2½ or 3 feet in height the first year, and 4 or 5 feet during the second year. It blooms and matures quite three weeks sooner than Sweet Clover. Yellow Clover is said to be the secret of the rich flavour of the famous Gruyere cheese of Switzerland.

Indian Sweet Clover or King Island Melilot (*Melilotus parviflora*), though only an annual, is a really wonderful plant, giving splendid returns on soil of poorest quality. In fact, there is no need to plant it where better crops would thrive. It contains more cumarin than other species, and should not be fed to milking cows, as it is liable to taint the milk and butter. A striking example of what this plant will do can be seen at King Island, which in a few years has been transformed by it from a stretch of almost useless sand-hills into one of the finest grazing districts in the Commonwealth. It has improved the value of the land 100 per cent. by enriching the soil, so that crops of a more exacting nature may now be grown there.

Sweet clover may be grown for pasture, hay or ensilage, as a honey-producing plant, for improving soil, and for turning under as a green manure, and the method of culture does not vary for the different species, nor does the manner of handling differ much from that required by other clovers. It is very adaptable in climatic requirements, its hardiness permitting it to thrive in sub-tropical heat, and its frost-resisting qualities allow of its being cultivated as far south as cultivation

Melilotus Alba. Dosr.

[(*a*) Portion of plant in flower and fruit. (*b*) Flower (enlarged). (*c*) Fruit (legume). (*d*) Seed (magnified). (*e*) Seed (natural size).

can be carried on. It is, therefore, suitable for growing over practically the whole of Australasia, from the far north of Queensland to the extremities of Tasmania. This statement does not imply that it will grow on every acre of our great continent, for Sweet Clover, like all its family, requires a certain humidity of soil which would not be

present in some parts of Central Australia; but given the necessary moisture, there is scarcely a soil so poor on which it will not flourish.

It must not be assumed, however, that Sweet Clover, on account of its hardiness, can be grown with less care than other legumes, and neglect of attention to details in preparation of soil has often led to much disappointment. The two main conditions which may be relied upon, however, to give maximum results are perfect drainage and abundance of lime. Its fondness for lime is the reason why it may be often seen in prolific growth on abandoned patches of gravelly limestone in mining districts. The bare spots sometimes seen on hilly pastures may be profitably sown with Sweet Clover, which, besides providing excellent forage, will fertilize these poor patches, so that later grasses will grow more abundantly on them. Sweet Clover will thrive on land too alkaline for grain or other clovers. Its long roots penetrate the subsoil, causing better drainage, and absorb the salts which are readily soluble in water.

Two outstanding virtues of this plant are its drought-resisting and frost-surviving qualities. While it will often withstand defective irrigation, and is capable of absorbing exceptionally heavy rainfall, it is still able to resist severe drought, as has been proved in the Mallee and Goulburn Valley of Victoria.

It may be sown either in spring or autumn, and cultivated in the same way as Red Clover. In rabbit-infested areas it is more advisable to sow in spring than autumn, as rabbits are very fond of the tender young plants in winter, but do not seem to trouble them so much in summer when other herbage is available.

Sweet Clover is a most valuable honey plant, and the honey produced from it is clear, with a slightly greenish tint, and of a strong vanilla-like flavour. As a green manure for ploughing under it would be hard to find a more suitable plant; it is particularly valuable for improving the soil for root crops such as mangels, beets, carrots, and parsnips. As ensilage, either grown alone or with other crops, it gives most satisfactory results, as it does not become slimy, as frequently happens with red clover or lucerne, and the food contains more protein than maize or other crops.

BRINE FOR CORNING BEEF.

A good pickle is made by mixing fifty lbs. of salt and five lbs. of finely-ground saltpetre, and dissolving same in twenty gallons of water. A test of whether there is enough salt in the brine is to place an egg in it; if the egg will not float, add sufficient salt to enable it to do so. Boil the brine and remove all scum as it rises to the surface. Five lbs. of sugar may be added, if desired, but it is not necessary except when pickling or curing bacon.

Spices are used only when it is desired to give the meat a definite spiced flavour.

The brine may be used over and over again, but it should be boiled occasionally in order to clarify it.

THE LARGE WHITE PIG.

By Sanders Spencer, in the Journal of the Ministry of Agriculture, England.

Although some writers have essayed to describe the origin of the Large White breed of pigs, and one or two have even mentioned the names of two or three men who were interested in pig breeding some three score or more years ago as the founders of the Large White breed, it must be admitted that complete success does not appear to have attended their labours. Indeed, if a claim had been made some fifty years ago that there existed a distinct type of Large White pig, it would have been most difficult to sustain it, for the simple reason that the white pigs found in Yorkshire and the adjoining counties had been so intermixed by the artisans and mill hands, who were the most persistent and successful exhibitors at the many district shows, that it had become impossible to foretell with any degree of certainty the size and character of a resultant litter of pigs from the mating of white boars and sows.

In the sixties and early seventies the favorite system of mating was to select a thick fleshed boar of small size and with a short head, and to mate it with a sow of the largest size, possessing quality of bone, flesh, and hair, a short face, and heavy jowls. As a rule there would not be the variation in size of the young pigs that might be anticipated, although later in life there might be a great difference in their development. The main reasons for this mode of procedure, which might not commend itself to pig breeders of the present day, were, that the fashionable pig of the period was one with a short head; that the wording of the prize schedules was usually, "For the best white pig not exceeding certain fixed ages"; that the most popular pig classes were those for pigs not exceeding six or nine months old; that prize winning pigs in the classes for young pigs were always in great demand at good prices from agents and exhibitors at the Royal and other large shows; that those pigs not required for breeding could be readily made fit for slaughter either as fresh pork or as baconers as soon as the weather became cold enough; that as a rule the young pigs, the result of mating a small and compact boar with a large sow, possessed the outward appearance and character of the sire and also acquired the quick growth of the dam, and thus had a great advantage when shown in the classes for small white pigs, which then were probably the most fashionable type of pig and most readily sold at the highest prices.

It may appear strange to pig breeders of the present day that exhibitors of pigs should purchase at high prices pigs of such uncertain breeding which were almost sure to develop unevenly; but the conditions were quite different half a century ago from those existing to-day. In the first place there was no fixed type or qualification for Small, Middle or Large Yorkshires, as they were then termed. The pigs of all three breeds were supposed to have short heads; this was imperative with Smalls and Middles and almost universal amongst Large Yorkshires.

Mere size at the time of exhibition was the determining factor as to classification, so that it was possible for a white pig to pass and win as a Small Yorkshire when young, and to develop so as to qualify subsequently for exhibition as a Middle White (or, as they were classified at the Royal Agricultural Society's show, as "a pig of any breed other than Berkshire, Small Black, Small Yorkshire, or Large Yorkshire"). Indeed, it was declared that one pig was actually exhibited in all the three classes for White Yorkshires at different shows. It is within the knowledge of the writer that the same pig has won at the Royal as a Small Yorkshire and in the nondescript class, and that a pig has won in the latter class and then in later years has won as a Large Yorkshire. Any difficulty which might have arisen was easily overcome by entering a pig as "age and breeder unknown." This last practice had become so common, seven prizes for pigs so described having been won at one Royal show, that the buyers from the United States discussed the question in the American live stock papers and asked how any pigs of unknown descent could qualify in the classes for pigs of a defined breed and possessing a pedigree? This, and the difficulty, if not impossibility, of identifying white pigs and their breeders, were two of the chief causes of the establishment of the National Pig Breeders' Association some forty or more years ago. Some few years before the classification of Yorkshire pigs had been altered at the Royal Agricultural Society's shows, where prizes were offered for Small White pigs, Large White pigs, and Middle White pigs, and as scales of points had been drawn up, these with the registered pedigrees of the pigs entered, insured to a considerable extent that the exhibits were accurately described and shown in the various classes. The comparatively short recorded pedigrees possessed by the pigs entered in the first few volumes afforded proof that the three varieties of Yorkshire pigs had not been bred on defined lines for any great length of time prior to the foundation of the herd book. Indeed it would be most difficult, if not impossible, to furnish proof that the Large White pig existed as a distinct and separate type before the seventies of last century.

About that period there was also a great change in the type of pig demanded by the purveyors of pork and especially by the bacon curers. Pigs furnishing a much smaller proportion of fat to lean meat were in more general demand. The introduction of the cold air system had enabled bacon curers to carry on operations with as great ease during the summer months as during winter, so the necessity ceased for salting heavily the bacon intended for consumption during the summer. The necessity for bacon pigs carrying a large proportion of fat to lean also ceased when the mild-curing system became possible with the aid of the cold air chambers. With the passing of the heavily salted lean portion of the bacon there sprung up an enormously increased demand for what has been termed "breakfast bacon," *i.e.*, lightly cured bacon carrying comparatively little fat and manufactured from pigs long in the carcass and thus affording the largest possible proportion of the middle portion of the side of bacon.

The bacon curers in these islands gave free expression in the public press to their requirements as to the form and degree of fatness of the

pigs for which they were enabled to pay the highest price, so that the breeders of the various kinds of pigs had placed before them a model to which they might work up. The general body of pig breeders did not seem inclined to make any great alteration from the type of pig which they had been breeding, but one or two breeders of Large White pigs were apparently impressed with the fact that with some modification their favourite breed of pig could be made so that it would qualify as a bacon curer's pig. The jowl was lightened, the shoulders were made much lighter, the lean meat increased, the bone was made of finer quality, the form of the ham was improved and the quantity of fine hair increased. In the seventies of last century the Large White was a large pork pig, in the eighties and nineties it was a bacon pig. The so-called improved Large White and its crosses were tried by the home curers with satisfactory results; the bacon placed on the London and Manchester markets complied so much more nearly with the requirements and fancies of the consumer than did the imported bacon, that the manufacturers of bacon in Denmark purchased a considerable number of large white boars from a large herd in the Midland Counties. The results were so satisfactory that the Canadian curers sent orders for breeding pigs of the Large White breed to the same breeder. Eventually exports of Large White pigs of this distinct type were made to all those foreign countries where bacon curing is carried on to any extent.

The Large White pig had become so popular that foreigners whose native pigs were far too small and short, purchased at prices which were at the time considered to be exceedingly high, the largest pigs of the breed, those which were long in the face and high on leg. Unfortunately, owing to this, a large proportion of the breeders of Large Whites followed the example of the Berkshire breeders by studying the requirements of this limited portion of the buyers of pure-bred pigs whose wants were of a special character, and by so doing rendered their pigs of considerably less value to the greater portion of their customers whose demands were for smaller fine joints from pigs which developed early. The breeders of the Berkshires have restored their pigs to public favour and usefulness and there are clear signs of an awakening of the breeders of Large Whites to the fact that although fancy points help to sell a few pigs at high prices for a short period, the commercial market is of greater importance and is more continuous. The number of breeders of Large Whites does not appear to have increased in recent years.

Although the sows of the Large White breed are at the least the equals of sows of any other breed or cross in prolificacy, in milking, and in the general duties of motherhood, the strongest claim for popularity of the Large White pig probably rests on its wonderful capacity for crossing on pigs of almost any breed and rendering the joint produce suitable for the wants of the bacon curer. At the present time it is declared that no breed or cross of pigs so nearly supplies the wants of the manufacturer of the bacon which realizes the highest price on our best markets and which is in the greatest demand than does the cross-bred pig produced by a Large White boar and a Large Black sow.

The National Pig Breeders' Association has published what is termed a standard of excellence which may be of some value but which might perhaps be of still greater assistance if the market and the breeding value of each point had been stated. It is as follows:—

Colour.—White, free from black hairs and as free as possible from blue spots on the skin.
Head.—Moderately long, face slightly dished, snout broad, not too much turned up, jowl not too heavy, wide between the ears.
Ears.—Long, thin, slightly inclined forward and fringed with fine hair.
Neck.—Long and proportionately full to shoulders.
Chest.—Wide and deep.
Shoulders.—Level across the top, not too wide, free from coarseness.
Legs.—Straight and well set, level with the outside of the body, with flat bone.
Pasterns.—Short and springy.
Feet.—Strong, even and wide.
Back.—Long, level and wide from neck to rump.
Loin.—Broad.
Tail.—Set high, stout and long, but not coarse, with tassel of fine hair.
Sides.—Deep.
Ribs.—Well sprung.
Belly.—Full but not flabby, with straight underlines.
Flank.—Thick and well let down.
Quarters.—Long and wide.
Hams.—Broad, full, and deep to hocks.
Coat.—Long and moderately fine.
Action.—Firm and free.
Skin.—Not too thick, quite free from wrinkles.
Objections.—Black hairs, black spots, a curly coat, a coarse mane, short snout, inbent knees, hollowness at back of shoulders.

Large bred pigs do not fully develop their points until some months old, the pig often proving at a year or fifteen months a much better animal than could be anticipated at five months and *vice versâ*, but size and quality are most important.

ARSENICAL POISONING.

The medicinal treatment for arsenical poisoning should be prompt and thorough. In small animals, such as dogs and cats, an emetic is advisable, such as salt and mustard in about 3 oz. of warm water. With horses and cattle, medicine must be given, which forms an insoluble compound with the arsenic.

The following treatment is recommended:—Take about 2 oz. of ordinary washing soda, and dissolve it in about half-a-pint of water, then add 2 oz. liquor ferri perchlor; a sediment forms, and it is then strained through a piece of fine linen and the sediment collected and mixed in 1 pint of cold water and given as a drench, being repeated every half-hour for at least five or six doses.—*Queensland Agricultural Journal.*

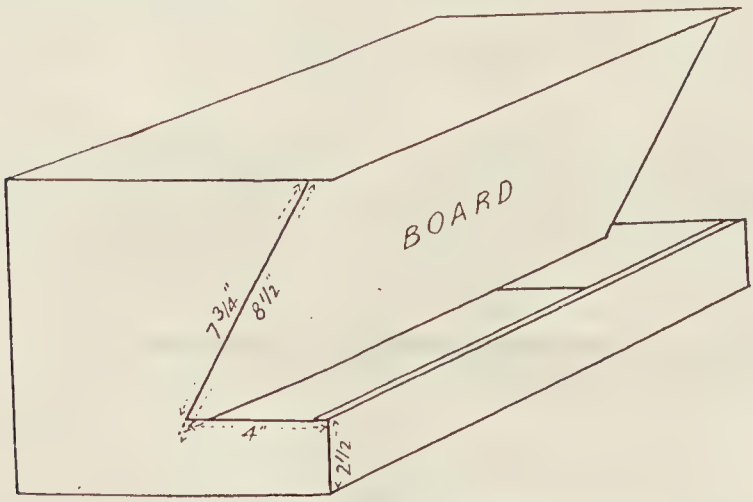
HOPPERS FOR FEEDING DRY MASH TO POULTRY.

SIMPLE METHODS OF MAKING.

W. C. Rugg, Poultry Foreman, Werribee State Farm.

1. From Kerosene Tins.

Cut tin along part indicated by dotted lines on diagram. Turn edges and hammer smooth and turn half-an-inch of front inwards to form a lip to prevent birds pecking the food over the front and wasting it. Cut a piece of thin board (portion of a kerosene case will do) to fit neatly where marked; the bottom edge of this board should be half-an-inch lower than the front of trough, and it can be held in position by a few nails driven through the tin round the edge of the board.



Dry Mash Hopper made from Kerosene Tin.

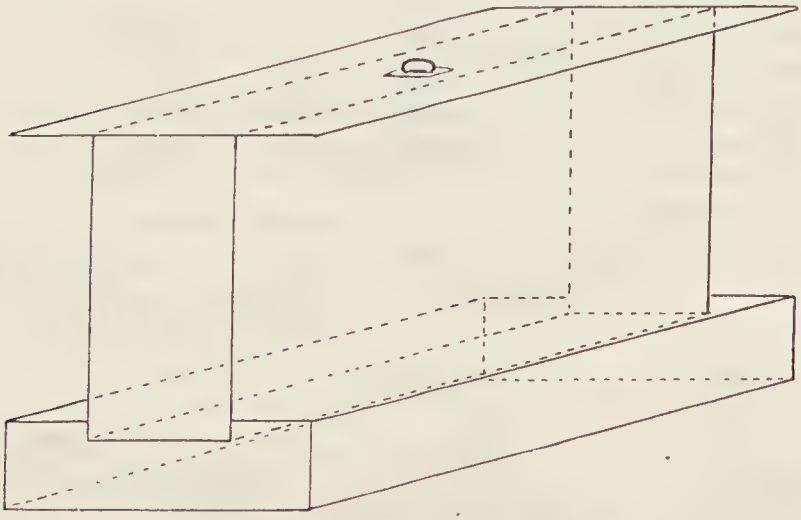
To fill the hopper place it on its back and place some dry mash in it, and shake mash to the top and repeat till full.

When using a hopper of this kind for small chickens, fix a piece of wire netting of an inch and a half mesh across the trough. The chicks will feed through the netting, and will be prevented from getting into the food and scratching it out.

2. From Kerosene Cases.

Two hoppers can be made from three cases. Cut one the full length on the flat to make a tray 4 inches deep, and remove a piece of 7 inches long x 1 inch deep from each end of this tray. Then make a box 14 inches deep without top or bottom; use a board 6 inches x 1 inch for the ends and pieces of kerosene cases for the sides. This will make a

magazine to hold the food. It should fit nearly into the spaces 7 x 1 inch cut out of each end of the tray. For the top take a piece of tin 18 inches wide and 21 inches long; nail a piece of 6-in. x 1-in. board along the centre of the tin; this board should fit inside the top of the magazine. The tin will project over the tray, and prevent the birds' droppings falling into the food should they perch on top of the hopper. Tack a lath an inch in width to the sides of the tray all round to form a lip so that the birds may not pick the food over the front, and so wasting it.



Dry Mash Hopper Made from Kerosene Cases.

Modern Farm Practice.

What has the farmer learned in these fifty years . . . ? He has learned that the soil is not a sullen, lifeless thing, only useful as a standing place for his crops, but that it is rather to be likened to a farm animal and valued accordingly. . . . Practically all that we know regarding the bacterial life of the soil is a harvest of the last fifty years. The formation of humus in the soil, the solution of plant food from the soil minerals, the conversion of nitrogenous materials into forms which the crop can utilize, and the gathering of free nitrogen from the air—these are the great functions of the soil bacteria. Much remains to be learned of their nature and their needs . . . but what we know already is coming into common farm knowledge and having its effect on farm practice.—Dr. E. H. Jenkins, Connecticut, U.S.A.

CLEANLINESS IN DAIRY AND FACTORY.

By G. C. Sawers, Cheese Expert.

A dairy or butter factory does not consist of a room and nothing more, and such a place should not be spoken of as clean unless everything down to the smallest utensil is quite free from all dirt, and, further, that all employed there are clean, and that the surroundings of the building are kept free of all boxes, barrels, &c., and that the wood pile is neatly stacked and the chips raked into a tidy heap.

The boiler and engine room should be kept as neat and clean as any other room. The walls and ceiling should be whitewashed or painted, and a shelf or two placed on the wall to hold tools, &c., when not in use. The boiler and engine should be painted. It should be wiped over daily, first, with an oily cloth, and then polished with a dry one. All brass mountings must be kept bright and the valves and unions well packed so as to prevent waste of fuel and any escape of steam. The floor should be swept or scrubbed every day, and the firewood must be neatly stacked.

The making and curing room walls and ceilings also should be given a fresh coat of whitewash once a year. If whitewash be chosen, no skim-milk or casein preparations should be used, otherwise moulds will develop. All vats, cheese presses, and troughs must be painted or varnished. The piping should be given a coat of aluminium paint; this will tend to brighten the room. The windows ought to be regularly and thoroughly cleaned.

It is essential that milk chutes, scales, vats, &c., &c., be cleansed as soon as practicable after use. They should first be washed in cold water, then with hot water, to which a little soda has been added, and then scalded.

Nowhere does the old rule of a place for everything and everything in its place apply with greater force than in a cheese factory.

When the whey is being drawn from the vats care must be taken to prevent any running on the floor, as the acid of the whey will eat into the cement. By using a tin or galvanized chute with head attached, the escape of whey may be stopped.

The curd racks should be well scrubbed and washed every day and placed in the open air for some time. At least once a month they ought to be placed in a solution of lime water.

The draining cloths should be first rinsed in tepid water and then in hot water to which soda has been added, and afterwards dried in the open air. If not thoroughly washed they may develop a heavy whey smell, which may sometimes even be tasted in the cheese.

The cheese presses and hoops should be washed and scalded once a week. This is particularly necessary in the case of the hoops, as unless they are perfectly clean whey may adhere on the inside; this

will cause the rind on the cheese to become rough and loosen the binding, and thus possibly allow the cheese to crack.

The scrubbing of the floor of the making room, gutters, &c., should be a daily duty.

The curing room must be kept well aired, and the floor and shelves clean, otherwise mites may breed there and cause trouble and loss. It is best to keep nothing in this room but cheese, which should be stacked evenly on the shelves. If cloth and binding be stored there, they must be stacked in a neat way. On no account should any timber or boxes be left there. After every consignment of cheese has been sent away the shelves should be at least wiped down with a damp cloth; or if the cheese has lain upon them for any length of time they should be scrubbed. The floor of the curing room, like that of the other rooms, should be kept clean and be frequently scrubbed.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

If the winter spraying has been delayed, it should be completed as quickly as possible, and before the buds begin to swell and burst.

It is not advisable to spray the stone fruits with the red oil emulsion at this time, as there is danger of burning and destroying the early buds that may be swelling, and consequently loosen their outside scales. It will be safe, if the work be done at once, to spray apple, pear and quince trees with this spray, especially where the Eyrobia Mite, scale insects, or woolly aphis are prevalent.

If it is intended that the lime-sulphur wash be the specific for these and other pests, it may be used with safety, although the spraying should be completed as early as possible.

That the lime sulphur is valuable as a specific against "Black Spot" of the apple was shown in the report of the experiments in the *Journal of Agriculture* for August, 1918. The first spray should be given when the flower buds are more green than pink; and the second spray, when the centre flowers of the blossom cluster are pretty open.

The same report showed that a spray of 6.8.40 of copper-soda, sprayed when the earliest buds were showing pink, was a complete success against the "leaf curl" of the peach.

Where peach aphis has appeared, it will be advisable to spray at once with a strong nicotine solution. Tobacco stems should be soaked in cold water for some days, and a teaspoonful of caustic soda added to a cask of steeping stems. The liquid should be made strong, and every endeavour made to kill out the first insects that appear. The preparations known as Black Leaf 40 and Nicotox are useful for this work.

The pruning of deciduous trees should be at an end this month The pruning of evergreens such as oranges, lemons, and guavas, may be left until later.

Young deciduous trees must be planted not later than this month. The soil should be trodden firm round the roots, and, when planting has been completed, the tree ought to be headed back to three or four buds on each arm.

Preparation may be made for planting citrus and other evergreen trees. It is necessary that the soil be well ploughed and sweetened in anticipation of planting in September and October.

In root-borer affected districts, the beetles will begin to appear during the latter part of the month. A close observance should be kept on them and the insects regularly collected and destroyed.

The Flower Garden.

All winter-flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and hand picking. The seedlings growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as delphiniums, cannas, shasta daisy, herbaceous chrysanthemums, rudbeckias, salvias, and phlox, may still be planted out. If it is intended to leave the plants in the places they occupied last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By this means the plants retain their vigour, and are able to produce good flowers each season.

Evergeen shrubs may now be planted out, if the spots chosen for them have been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants, including Gladioli, may now be planted. Gladioli so planted will bloom in December.

The Vegetable Garden.

The plots should be well dug over at this time, adding gypsum or lime where any pests have been prevalent. In other beds stable manure should be well worked into the soil.

The soil should be rich, well worked, and warm, so that a quick growth may result. Vegetables quickly raised are generally more tender than slowly grown ones; and frequent changes of crops in the plots will give better results. At this season, the weeds will require constant checking; frequent use of the hoe will, therefore, be necessary, and in the rows hand-weeding should be resorted to.

All seedlings should be planted out, especially seedlings of cabbage, cauliflower, lettuce, and onion. Seeds of peas, carrots, parsnips, radish, lettuce, tomato, and broad beans may be sown.

Where they can be sheltered and protected from frosts, young tomato plants may be planted out for early fruiting. One method of managing these early plants is to place the young plant a few inches below the surface, and then a box, 8 or 9 inches deep, with top and bottom removed, over the plant at ground level. This can then be covered loosely with a piece of glass whenever necessary.

Potatoes, artichokes, and asparagus crowns may be planted. Asparagus beds should be kept free from weeds; they should have a loose surface, and a light top dressing with old manure would be beneficial.

In the frames, cucumber, vegetable marrow, melon, pumpkin, water and rock melon seeds may be planted. These are best planted in pots placing three or four seeds in each pot; they then suffer no check when being transplanted into beds.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

HORSES.—Feed stabled horses well; give green stuff if available. Continue rugging to encourage the shedding of the coat; good grooming will also be beneficial. Give hay or straw to grass-fed working horses. Feed old and badly-conditioned horses liberally. In foal mares due to foal early, if worked, should be turned out to paddock. Stallions doing stud duty should be fed liberally. Equivalent amount of cracked Indian corn (maize) may with advantage be substituted for oats, if latter grain is scarce.

CATTLE.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how

to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland :— Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

Sheep.—Wherever early shearing is possible, and shelter available, all sheep to be disposed of can be fattened earlier, if shorn. Sheep, or lambs in the wool, when not good enough for freezing, also thrive better after being shorn. Where insufficient knowledge of grading cross-bred wool exists, draft the coarse sheep from the fine before coming into the shed, and shear and bale separately. Clean all daggy sheep before bringing them on to the shearing board. Avoid deep and careless skirting in small flocks. Only very seedy parts, and heavy fribs and stains should come off fleeces. Press in a box press, which forms square sides to bales, and avoid round bales, called "Sew Downs." Pack in all possible. Brand boldly and neatly on the long and narrow side. Clean carefully all straw, chaff, &c., from shearing place. Cut back all misshapen feet when noticed during shearing. Mark all ewes with misshapen udders, faulty mouths, yellow and common fleeces. Class all well-bred Merino-Longwool lambs before offering to exporters. Earmark, and keep best early-born lambs for future breeding and wool-growing. Well-bred, shafty, deep-stapled, fine to medium grade wools will be required for years. The world has an ample supply of short, and inferior wool.

Poultry.—September is one of the best months for hatching for winter eggs Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses and Insectibane or Izal in nests—nothing stunts chickens quicker than vermin. The food for young chicks should be fine oatmeal, stale bread crumbs or biscuit meal, a little calcined bird's grit, a little chopped green stuff such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

Farm.—Plant early potatoes, and work up fallow for the main crop: Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with the fallowing in the Northern Districts. Prepare land for tobacco seed beds by burning rubbish on the site; afterwards work up to depth of three or four inches.

Orchard.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with copper soda as the blossom buds are opening, as a preventive of "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution

FLOWER GARDEN.—Cultivate and work up the surface to a fine tilth—clear out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

VINEYARD.

Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as tying down of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted), cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swab vines preventively with acid iron sulphate to protect them from Black spot, or Anthracnose. Should next spring be a wet one, disastrous outbreaks are probable in vineyards which have not received proper treatment. To avoid scalding, swabbing must be completed before the buds commence to swell. A bulletin (No. 42) dealing with this disease will be posted on application. Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar.—Conclude spring racking early in month, if not already done. Fill up, regularly, all unfortified wines.

BEE-KEEPING.

During the first or second week of September all hives should be examined to see that each colony has a laying queen and sufficient stores of honey to permit of normal development. Bees work with a reserve of stores at this time of year, and when their supplies are reduced to a certain minimum, brood rearing is restricted, may cease altogether for a time, and when, as a result of prolonged unfavourable weather, the reserve stores are used up, even sealed brood may be torn open and thrown out and the colonies practically ruined for the season.

Strong colonies should have 15 to 20 lbs. of honey ahead of daily requirement, medium and small colonies proportionately less. When during the examination of the hives less than this amount is found, the shortage should be made good by feeding, blood-warm, and inside the hive, a syrup made by dissolving 1½ or 2 parts of best white sugar in one part of boiling water. What is known as a frame feeder is the most suitable one for this purpose, or a simplicity feeder in a shallow super over the brood chamber may be used.

When no feeders are on hand, the syrup may be poured in a fine stream from the lip of a jug into an empty comb laid flat into a suitable dish. The jug should be held about 12 to 15 inches above the comb, otherwise the syrup will not enter the cells. After filling both sides, and keeping it in an upright position for a few minutes to drain off the surplus, the comb can be returned to the hive, repeating the operation on succeeding days till the needs of the colony are supplied. Honey of unknown origin should never be used for feeding on account of the risk of introducing disease.

Any colony found queenless, as indicated by the absence of brood or eggs, may be kept going till a queen can be raised or procured, by giving a comb of eggs or young brood from a strong colony once a week, provided there are sufficient bees left to make it worth while; if too small, unite with the nearest normal colony.

In early districts and where colonies went into Winter strong in bees, swarms may be expected from the middle of September onwards. Hives and frames for the number of first swarms expected should be on hand and ready for immediate use, so that none of the bees' labour may be wasted by allowing them to build comb in a temporary box. All frames should be wired so that newly-built comb may not break down in handling or during hot weather. Under normal conditions a swarm with a good fertile queen will build all worker comb during the first three weeks. It is the only time a full colony will not build drone comb from starters of foundation. While the queen deposits eggs into the worker cells as fast as they are constructed by the bees there will be no drone cells built. After three weeks the young bees from the first-laid eggs will hatch out, and the queen will return to that part of the comb to again deposit eggs into the vacated cells, and the newly-constructed cells on the edges of the comb being neglected by the queen, the remainder of the space in the frames will be filled with drone comb.

The aim of the bee-keeper, therefore, is to confine the building of comb from starters to the number of frames likely to be completed during the first three weeks after hiving the swarm, by removing two, three, or four frames in which no comb has been built four or five days after hiving. The follower or dummy board is pushed up against the remaining frames, and when these are completed frames with full sheets of foundation are added to make up the set.

Hives should always stand level, crossways to the frames; in the case of swarms hived on starters of foundation it is particularly important. Comb is always built truly perpendicular, and if the hive is not level to the frames the wires will be outside, instead of in the centre of the comb.

TO POPULARIZE HONEY.

Every effort should be made by all interested in the honey business to stimulate the sale of the commodity, for there are still fairly heavy stocks on hand, and although honey can be kept for long periods without fear of deterioration, it is to the advantage of all concerned—providing, of course, a reasonable price can be obtained for it—that a good deal of the surplus be disposed of before the new season's crop comes. Something has already been said in this journal with reference to improving the honey market by co-operation and the decentralization of supplies, and in the past few months there has been some improvement in the matters of distribution and sales. The appointment of three practical apiarists as an advisory board to look after the bee-keepers' interests in co-operative marketing was one step in the right direction, and the co-operative retail marketing movement in which the New South Wales Apiarists' Association is now interesting itself, is another. There is still a good deal to be done, however, before marketing conditions will be on anything like a satisfactory basis. The bee-farmer's interest in marketing should not cease when his individual

crop is disposed of. Every effort should be made to induce distributing agents and storekeepers who have honey for sale to have the commodity exhibited in a position in which it will come well under the notice of possible customers. It is quite a common practice for such agents and storekeepers to place honey on shelves set so low as to be practically out of sight, and to give it the poorest sort of window display. Where space is limited, some sort of attractive display notice should be supplied and the retailer encouraged to make use of it. Again, those interested in the industry should never neglect an opportunity of inducing friends and acquaintances generally to use honey in their homes, or of bringing to the notice of the boardinghouse-keepers, hotel proprietors, and persons interested in the conduct of large institutions the value of honey as a food. Honey is a good food and a cheap one, and it is very much to the bee-keepers' interest that it should find a place on the lowliest table.

With regard to honey prices, the fact that there are among the ranks of bee-keepers a good many amateurs and bee-keepers in a small way, is apt to constitute something of a menace. Some of these dispose of their crop at a ridiculously low price to the disadvantage of the commercial man who depends on his returns for a living, for naturally the people who purchase at the low price do not afterwards care to pay a high one to the commercial bee-farmer, even though it be a fair one. Both the bee-keeper making the low-priced sales and the industry at large would benefit greatly, if trouble were taken to discover the fair market value for the produce.

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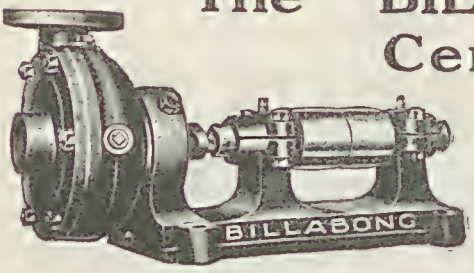

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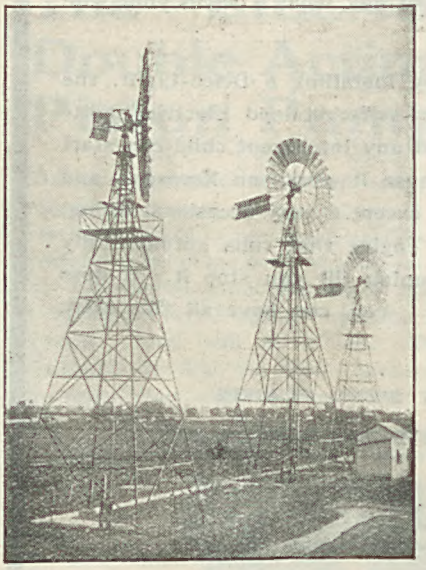

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